

**GROUP 80****HEATING AND VENTILATION****INDEX**

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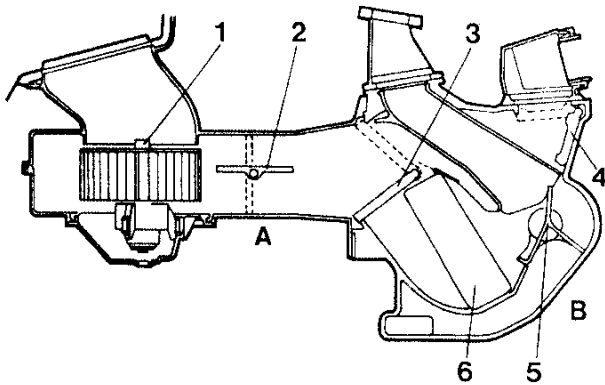


HEATING AND VENTILATION

MANUALLY CONTROLLED HEATER

DESCRIPTION OF THE SYSTEM

The manually controlled heater is composed of a single assembly and a panel containing the regulation knobs. The assembly, represented diagrammatically in cross-section in the figure below, is composed of an air conveyor (A) and a heater-distributor (B).



- A. Conveyor
B. Heating unit
1. Electric fan
 2. Outside air regulation vent
 3. Air mixing vent
 4. Upper air distribution vent
 5. Lower air distribution vent
 6. Heating/cooling radiator

The conveyor (A) can be divided into two parts, one upper and one lower. One end of the upper part is shaped so that it can be connected to the lower opening in the right hand side of the passenger compartment external compartment under the windscreen.

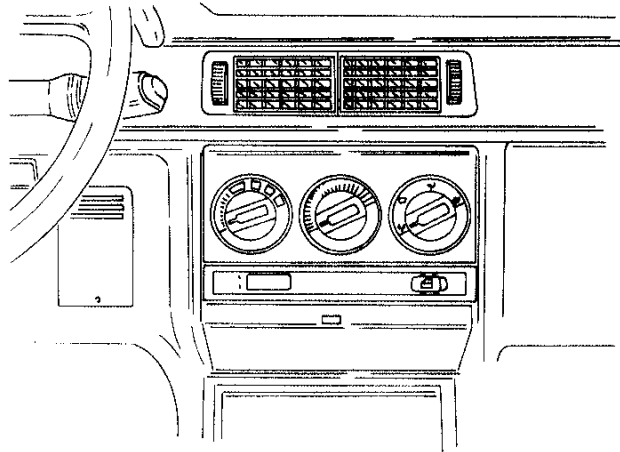
A four-speed electric fan (1) is installed on the lower part of the conveyor near the air intake vent.

In the central part, inside the conveyor, a vent has been installed (2) which can regulate and cut-off the flow of air to the heater-distribution unit. This is done by acting on the external mechanical control.

The following are housed in the heating-distribution unit (see diagram on left):

- mixing vent (3);
- two distribution vents (4 and 5);
- a heating/cooling radiator (6).

Three knobs for the regulation of the system are located on the control panel fitted to the central console (see diagram below).



By rotating the left-hand knob clockwise:

1. The outside air vent (2) is fully opened by a flexible transmission and assumes the position shown in the diagram on the left.
2. The four-speed electric fan switch is engaged.

By rotating the central knob in either of the two directions, the mixing vent (3) is rotated (by a flexible transmission) and at the same time the tap regulating the flow of engine coolant to the heating/cooling radiator (6) is either opened or closed.

By rotating the right-hand knob (which acts on a flexible transmission) in either of the two directions both air distribution vents (4 and 5) are rotated at the same time.

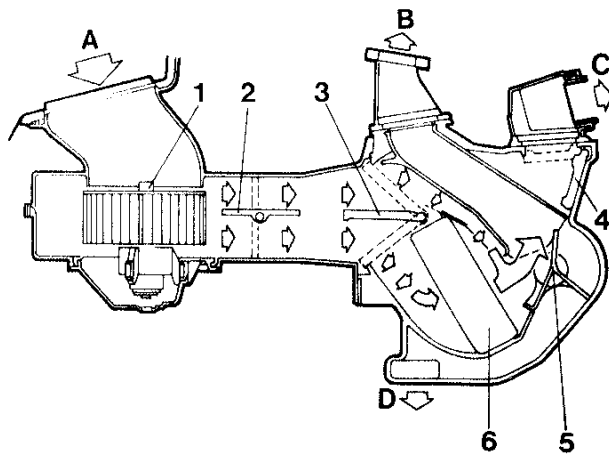


AIR FLOW IN THE CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT

The flow of outside air (A) (see diagram below) is conveyed to the heating-distribution unit via the electric fan (1) and the regulation vent (2).

Depending on the position of the mixing vent (3) the air flow is either directed entirely to the distribution vents (4 and 5) or passes either partially or completely through the heating/cooling radiator and then on to the air distribution vents (4 and 5).

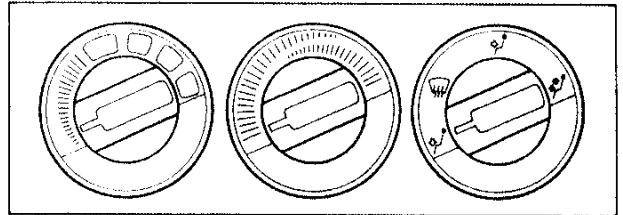
Depending on the position of the upper (4) and lower (5) vents the flow of air is conveyed to the various outlets in the passenger compartment.



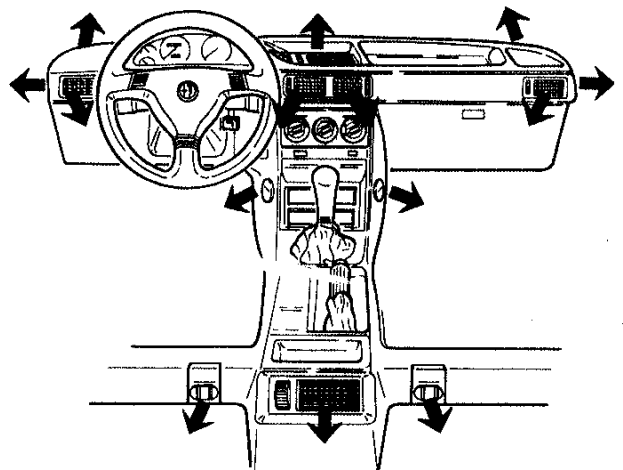
- A. Outside air flow
- B. Air flow to the windscreen diffusers
- C. Air flow to the front, central and side outlets
- D. Air flow to the floor diffusers at the rear and front of the vehicle
- 1. Electric fan
- 2. Outside air flow regulation vent
- 3. Mixing vent
- 4. Upper air distribution vent
- 5. Lower air distribution vent
- 6. Heating/cooling radiator

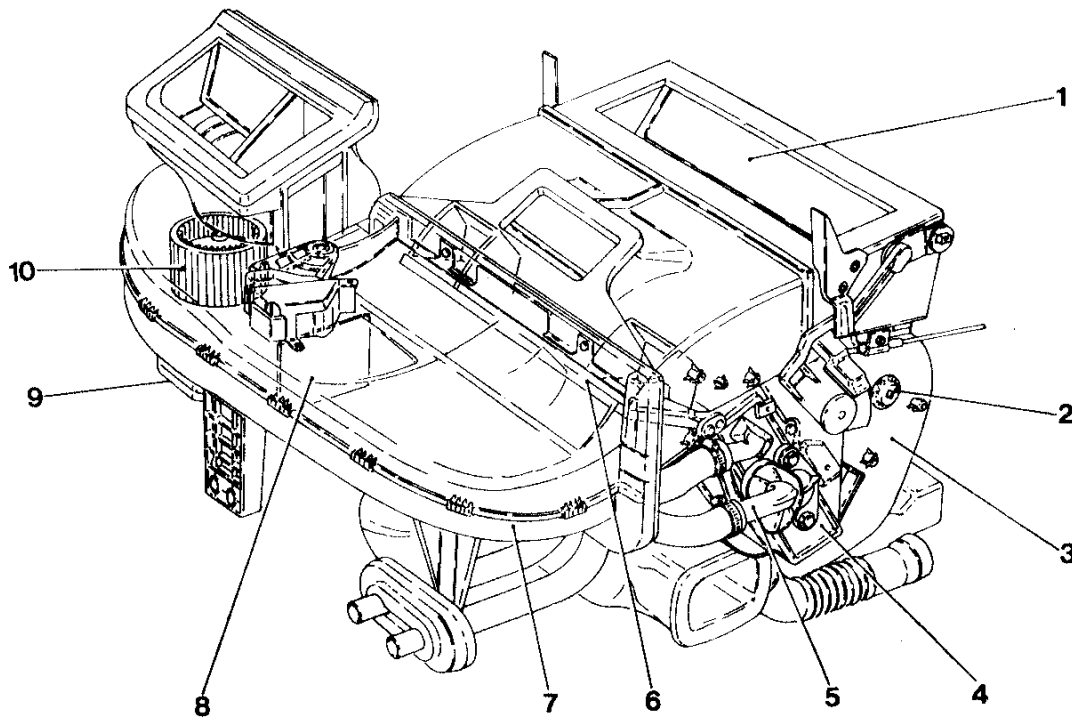
PASSENGER COMPARTMENT AIR-FLOW DISTRIBUTION

The ideograms identifying the various positions on the right hand knob on the control panel show to which of the various outlets and diffusers in the passenger compartment the air will be directed.



Each position of the right hand knob corresponds to a particular angle of the two air distribution vents. By rotating the knob clockwise to the various ideograms, the flow of air will be first directed to the floor in the front and rear of the vehicle, then to the windscreen and front side-window diffusers, and then to the front, central and side outlets, and then from the central outlets and to the floor outlets in the front and rear of the vehicle.



**IDENTIFICATION AND POSITION OF THE COMPONENTS OF THE CONVEYOR
AND HEATING-DISTRIBUTION UNIT**

1. Upper air distribution vent
2. Lower air distribution vent control gears.
3. Heating-distribution unit
4. Heating/cooling radiator-distributor
5. Tap for adjusting the entry of the engine coolant into the heating/cooling radiator
6. Air mixing vent
7. Conveyor
8. Outside air flow regulation vent
9. Resistor for the different fan speeds
10. Electric fan



REMOVAL AND REFITTING



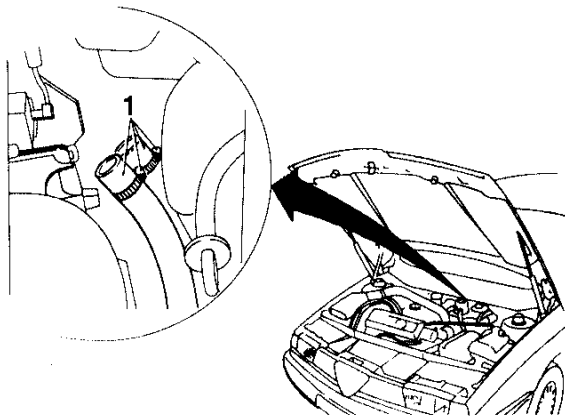
CAUTION

Disconnect the negative cable from the battery before carrying out any work.

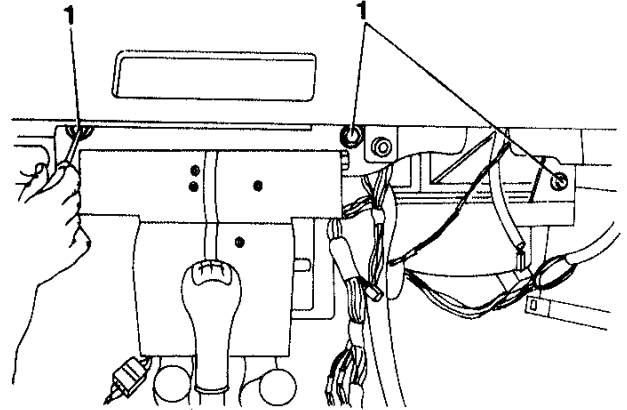
CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT

Removal

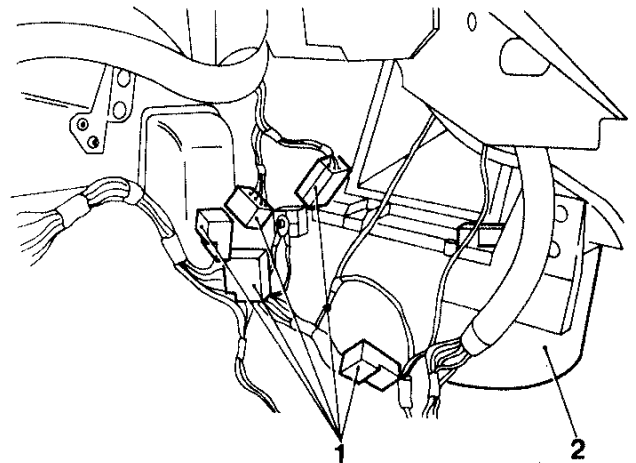
- Disassemble and remove the tunnel console (see GROUP 66).
 - Disassemble and remove the panel and control assembly (see relative paragraphs).
 - Disassemble and remove the skirting under the dashboard (see GROUP 66).
1. Acting from inside the engine compartment, loosen the metal clamps and disconnect the two rubber hoses (engine coolant to heating/cooling radiator delivery and return hoses).



1. Unscrew the screws securing the unit to the body.



1. Disconnect all the electrical connections including the earths.
2. Remove the assembly paying close attention to the gasket of the upper air duct inside the dashboard housing.



Refitting



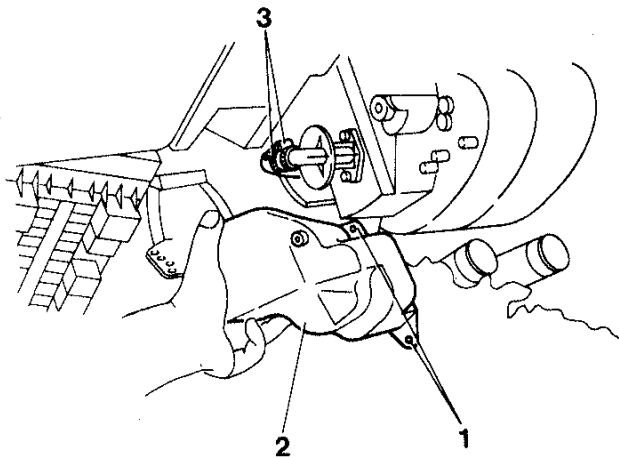
To refit, reverse the procedure employed for disassembly.



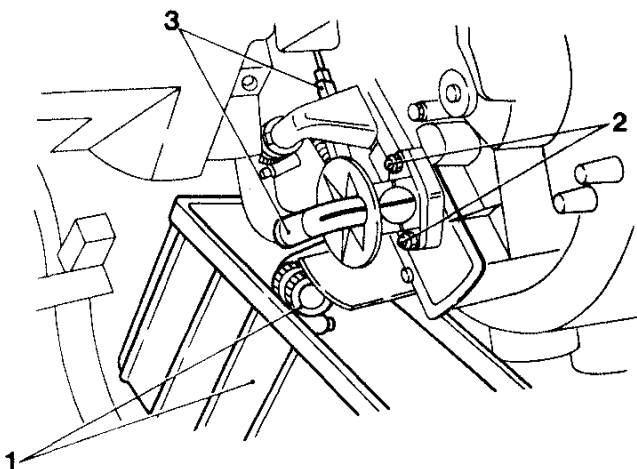
HEATING/COOLING RADIATOR

Removal

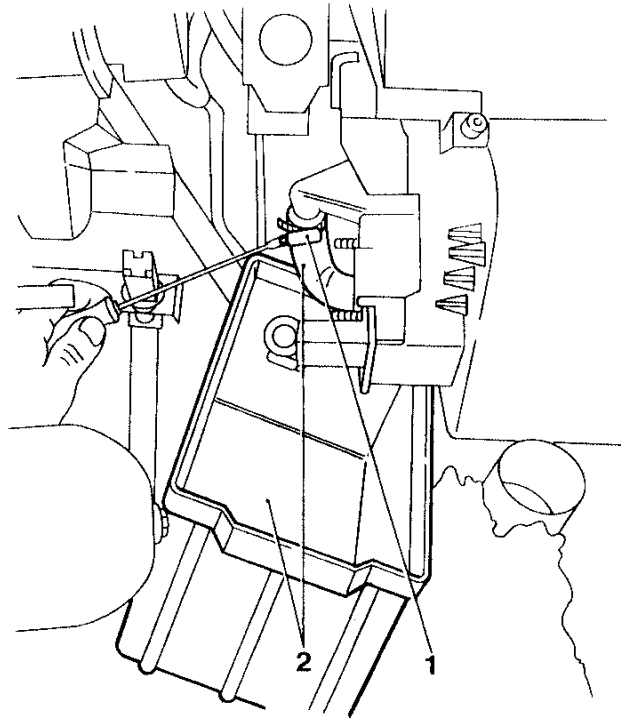
1. Loosen the two screws securing the heating/cooling radiator on the left-hand side of the conveyor (driver's side).
2. Remove the cover.
3. Loosen the two clamps securing the engine coolant delivery hose to the tap.



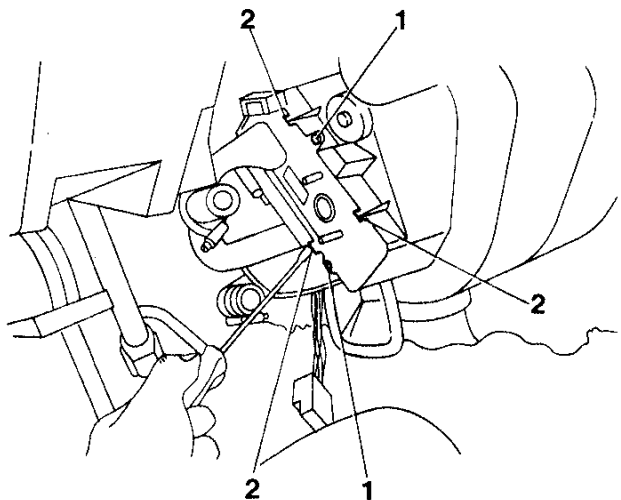
1. Disconnect the hose from the tap taking care not to spill any liquid. Use a container to catch any drips.
2. Unscrew the two nuts securing the tap to the radiator.
3. Remove the tap together with the relative control levers.



1. Unscrew the clamp from the upper engine coolant outlet hose.
2. Disconnect the hose taking care not to spill any liquid. Use a container to catch any drips.

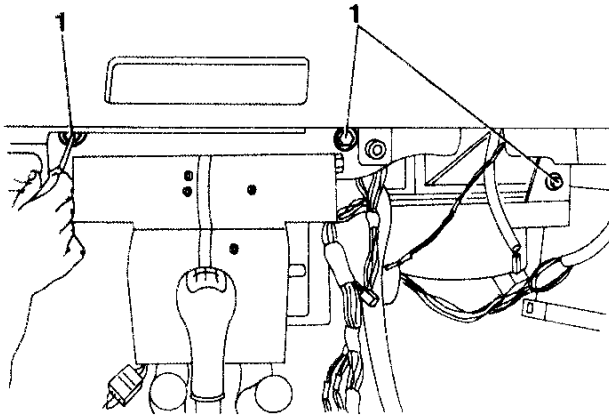


1. Loosen the two screws securing the radiator to the unit.
2. Disengage the tabs.





1. Loosen the upper screws securing the conveyor assembly to the frame. Pull out the radiator from the driver's side moving the assembly and the main fusebox downwards slightly.



Refitting

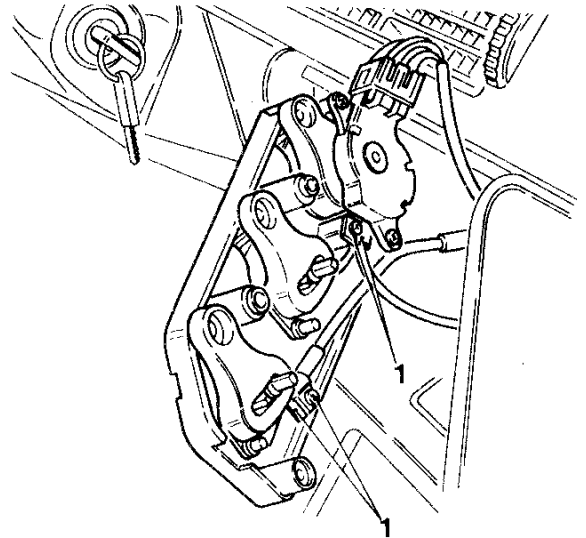


To refit, reverse the procedure followed for removal.

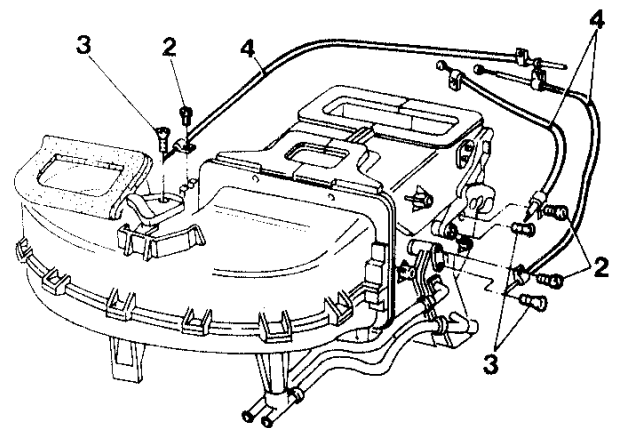
VENT CONTROL LINES

Removal

1. After dismantling the control assembly (see relative paragraph), loosen the screws securing the sheaths on the control panel and remove the clips securing the lines.



1. Disconnect the conveyor assembly (see relative paragraph).
2. Loosen the screws securing the sheath to the heater.
3. Loosen the screws securing the cables to the upper air distribution vents, external air flow regulation vent and heating/cooling radiator tap.
4. Remove the lines.



Refitting



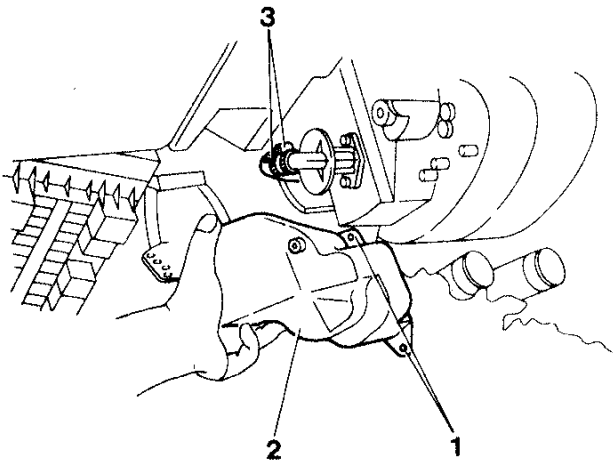
To refit, reverse the procedure followed for removal.



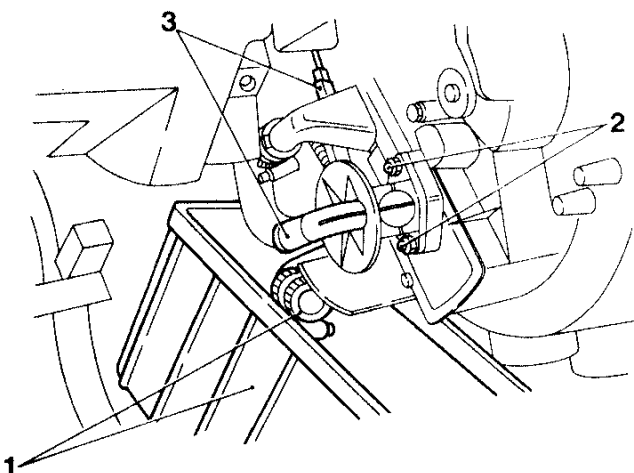
TAP REGULATING FLOW OF COOLANT INTO THE HEATING/COOLING RADIATOR

Removal

1. Loosen the two screws securing the heating/cooling radiator on the left-hand side of the conveyor (driver's side).
2. Remove the cover.
3. Loosen the two clamps securing the engine coolant delivery hose to the tap.



1. Disconnect the hose from the tap taking care not to spill any liquid. Use a container to catch any drips.
2. Unscrew the two nuts securing the tap to the radiator.
3. Remove the tap together with the relative control levers.



Refitting

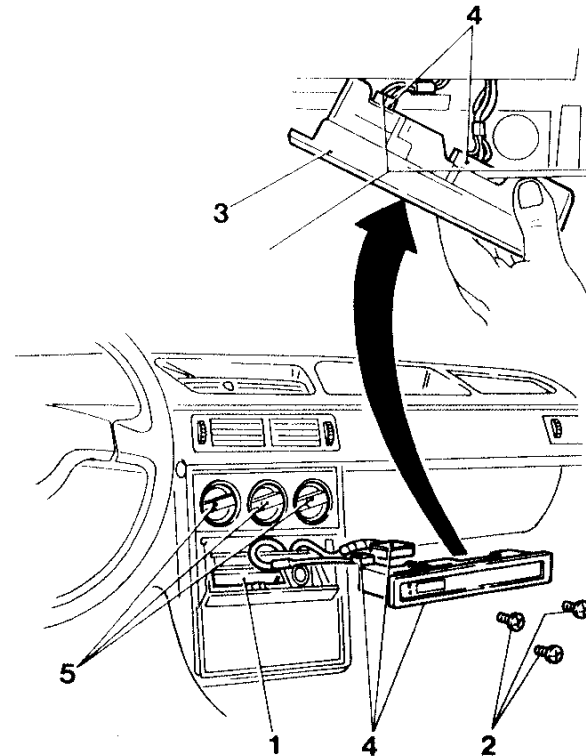


To refit, reverse the procedure followed for removal.

CONTROL PANEL

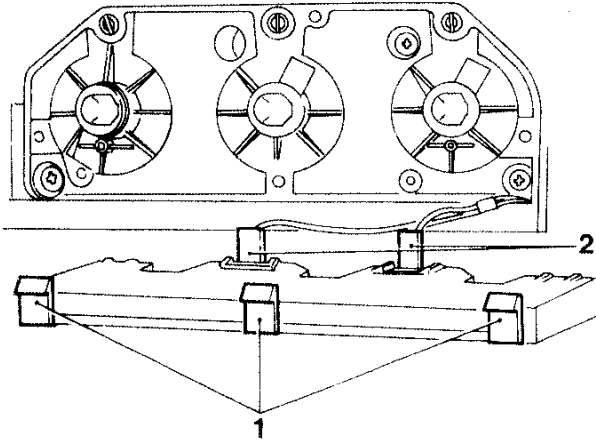
Removal

1. Remove the ashtray.
2. Loosen the three screws securing the Check Panel.
3. Pull out the Check Panel.
4. Disconnect the two electrical connectors and remove the Check Panel.
5. Withdraw the three knobs from the control panel.





1. Using a thin-bladed screwdriver to lever the tabs, remove the control panel from its housing.
2. Disconnect the two lamp-holders from the panel.

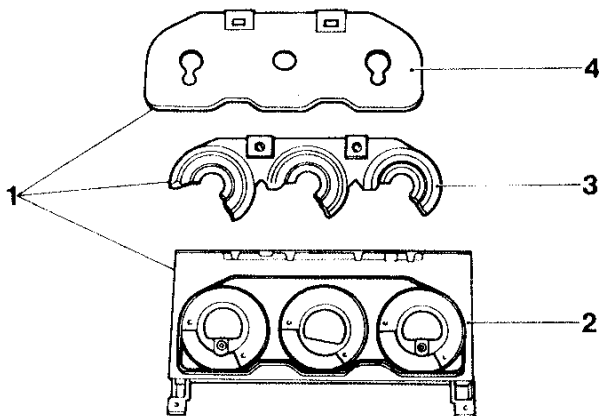
**Refitting**

To refit, reverse the procedure followed for removal.

DISASSEMBLING THE CONTROL PANEL

The cover (4) (see figure below) is fixed to the moulding (2) while the transparent light diffuser (3) rests on sections of coloured plastic on which the ideograms identifying the different operating positions of the knobs are engraved.

The three sections lay on the moulding and surround the knob seatings.

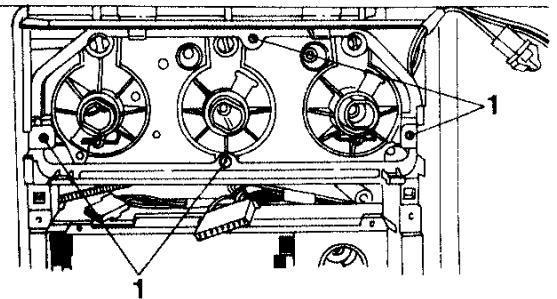


1. Control panel
2. Moulding
3. Transparent diffuser
4. Cover

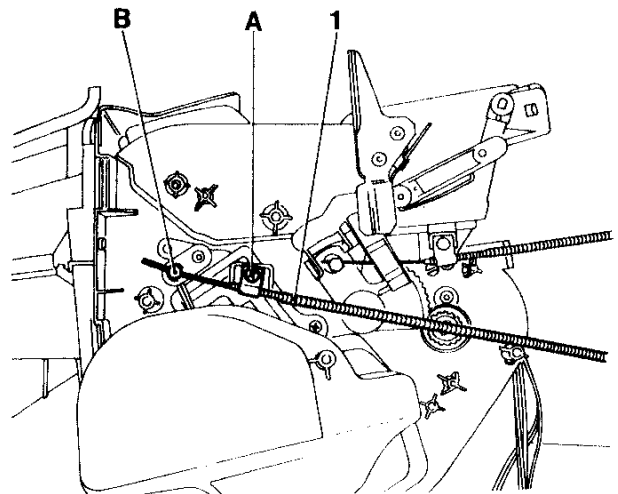
CONTROL AND SWITCH ASSEMBLY FOR THE DIFFERENT FAN SPEEDS**Removal**

After removing the control panel (see relative paragraph) proceed as indicated below.

1. Loosen the four screws securing the moulding (two for the control assembly, two for the front covering of the central console) and loosen the screws securing the control assembly to the heating-distribution unit.

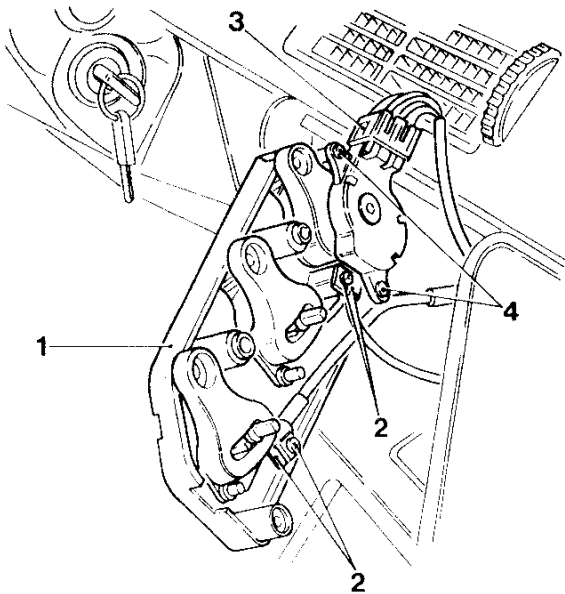


1. Disconnect the tap control line (connected to the central knob on the control assembly) from the heating-distribution unit on the left-hand side of the central console under the dashboard operating as follows:
 - loosen the screw (A) securing the flexible transmission cable sheath to the heating-distribution unit;
 - loosen screw (B) and withdraw the cable.

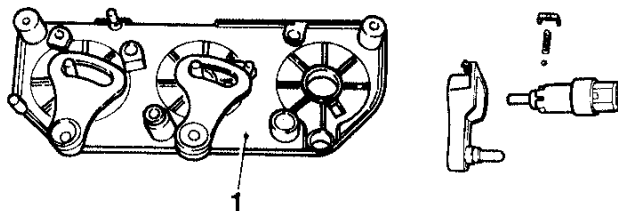




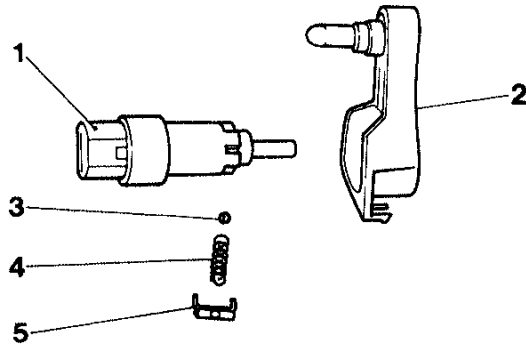
1. Pull out the control assembly from its housing as far as it will come.
On the rear part of the control support there are three sectors and the ends of three transmission cables.
2. On the control assembly, loosen the screws of the brackets holding the air distribution vent control line sheaths (right and left knobs). Disconnect the lines after removing the clip relative to the corresponding sector.
3. Disconnect the electrical connection from the fan-speed switch and remove the control assembly.
4. Loosen the two screws securing the fan-speed switch to the control assembly.



1. If necessary, dismantle the control panel.



Parts forming each single control



1. Toothed sheath
2. Sector
3. Ball
4. Spring
5. Retaining clip

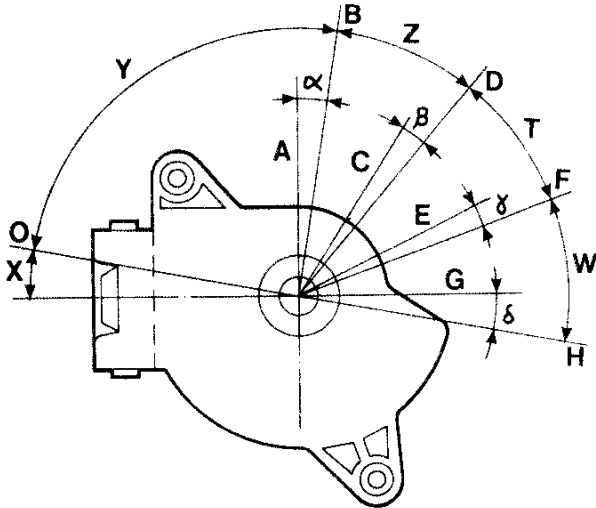
Refitting



To refit, reverse the procedure followed for removal.



Angles of action of the Internal contact of the electric fan-speed switch



- X = 10° No-load angle of action
- Y = 90° Angle of action to open the air inlet vent
- O. Position corresponding to 1st position of the knob
- A. Engagement of 1st fan speed
- B. Position corresponding to 2nd position of the knob
- C. Engagement of 2nd fan speed
- D. Position corresponding to 3rd position of the knob
- E. Engagement of 3rd fan speed
- F. Position corresponding to 4th position of the knob
- G. Engagement of 4th fan speed
- H. Position corresponding to 5th position of the knob

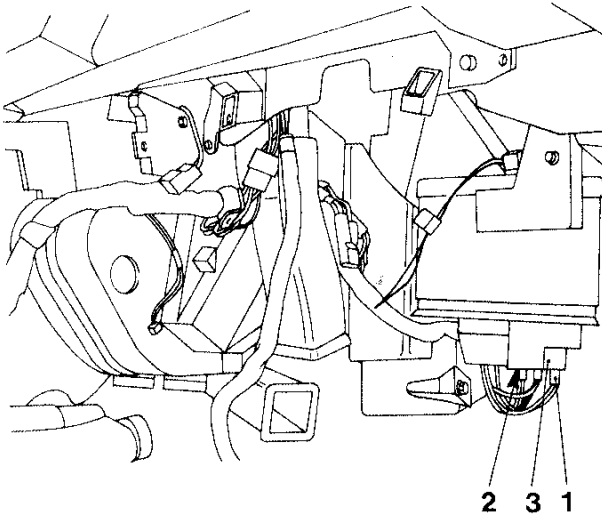
α and $\delta = 10^\circ$
 β and $\gamma = 5^\circ + 10^\circ$
 $Z - T - W = 30^\circ$

CHART DEPICTING THE INTERNAL CONNECTIONS OF THE FAN-SPEED SWITCH

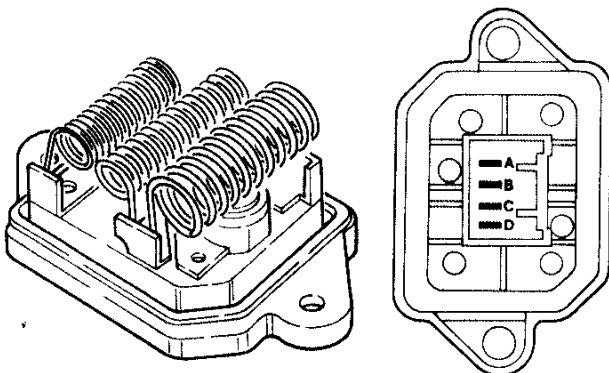
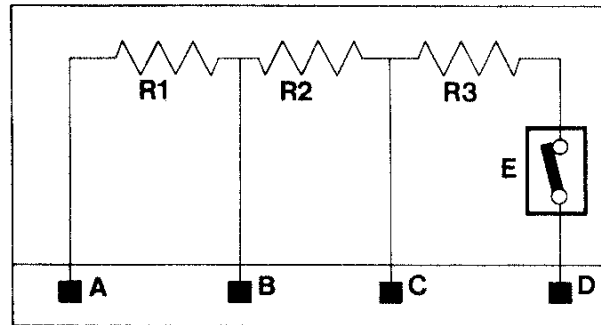
| BLADES | KNOB POSITIONS | | | |
|--------|----------------|----|-----|----|
| | I | II | III | IV |
| | | | | |

**RESISTOR FOR THE DIFFERENT FAN SPEEDS****Removal**

- Operate as follows in the compartment under the right-hand part of the dashboard.
- 1. Disconnect the connector from the header of the resistor.
- 2. Loosen the two screws securing the resistor to the lower part of the heating-distribution unit in the seating indicated by the arrow in the illustration.
- 3. Remove the resistor.



Detail of the resistor and the connector socket.

**Wiring diagram relative to the resistor**

Resistance R1 (between terminals A and B) =
2.1 + 2.3 Ω

Resistance R2 (between terminals B and C) =
0.9 + 1.1 Ω

Resistance R3 (between terminals C and D) =
0.3 + 0.4 Ω

E. Bimetall thermostat

RESISTANCE VALUE ON THE BASIS OF THE FAN SPEED

| Speed | Terminals affected | Resistance value |
|----------------|--------------------|-------------------|
| 1 ^a | A - D | 3.55 Ω |
| 2 ^a | B - D | 1.35 Ω |
| 3 ^a | C - D | 0.35 Ω |
| 4 ^a | - | resistor excluded |

CALIBRATION VALUES OF THE BIMETAL THERMOSTAT

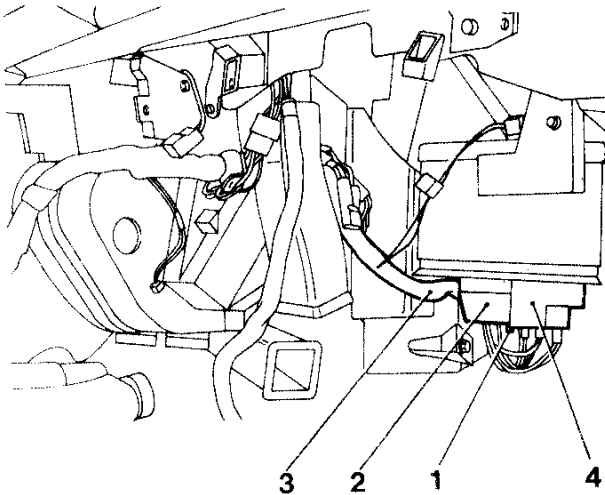
| | |
|----------------|------------|
| circuit open | 85° + 95°C |
| circuit closed | - 10°C |

Refitting

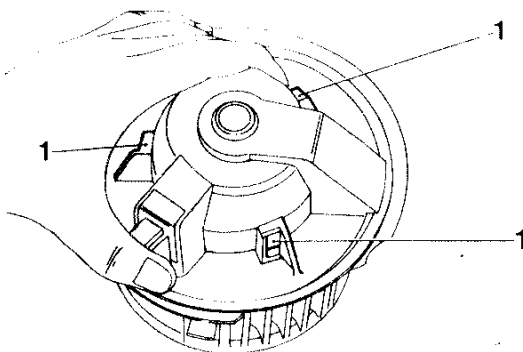
To refit, reverse the procedure followed for removal.

**ELECTRIC FAN****Removal**

- Working from the compartment under the right-hand part of the dashboard, proceed as follows.
- 1. Using a thin-bladed screwdriver raise the retaining tab.
- 2. Rotate the rear block of the electric fan a few degrees anticlockwise.
- 3. Disconnect the power supply connector from the electric fan.
- 4. Remove the complete fan block.



1. Using a screwdriver, press on the three rubber tabs on the electric fan and remove the cover.

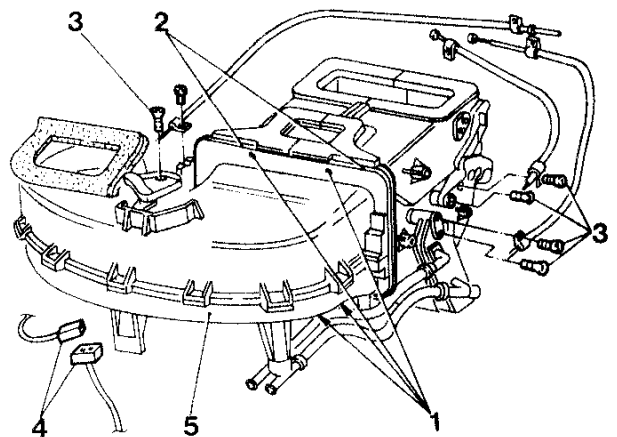
**Refitting**

To refit, reverse the procedure followed for removal.

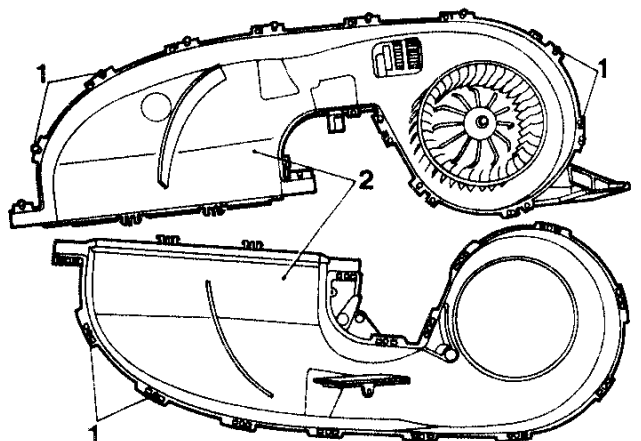
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EXTERNAL AIR-FLOW REGULATION VENT**Removal**

- First carry out the removal operations given in paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
- 1. Loosen the four screws securing the conveyor to the heating-distribution unit.
- 2. Apply leverage to the tabs.
- 3. Loosen the screws and remove the lines.
- 4. Disconnect the electrical connectors from the electric fan and from the resistor.
- 5. Disconnect the conveyor from the heating-distribution unit.



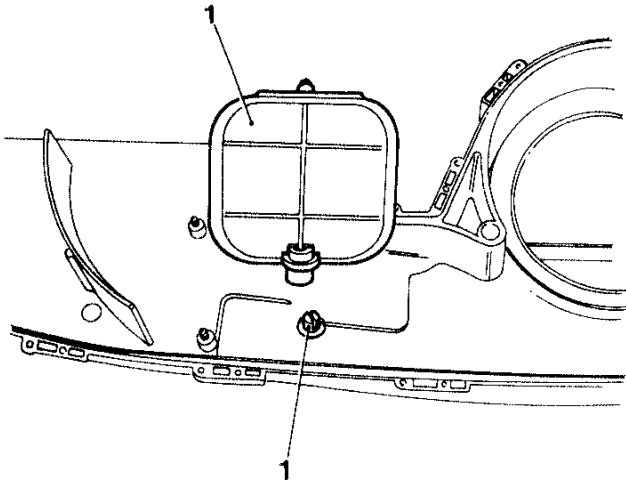
1. Using a thin-bladed screwdriver, apply leverage to the tabs and loosen the screws on the two casing halves of the conveyor.
2. Separate the two casing halves of the conveyor.



07 - 1991



1. Press the small clip inwards and remove the vent.



Refitting

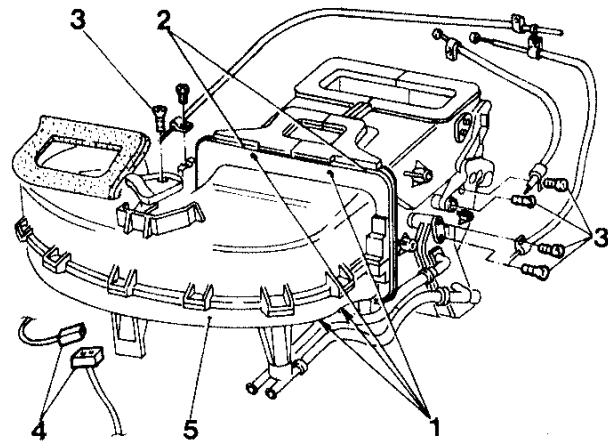


To refit, reverse the procedure followed for removal.

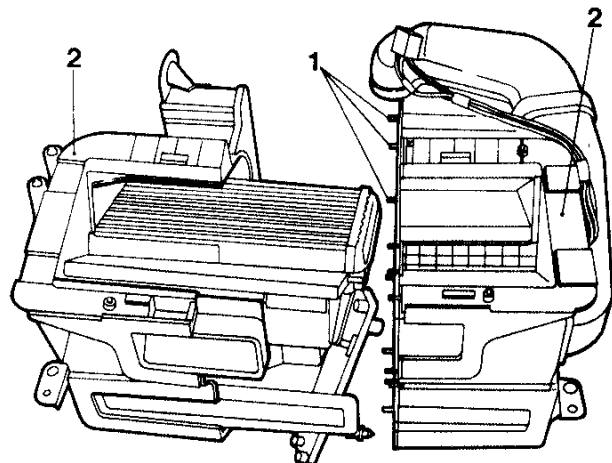
AIR MIXING VENT

Removal

- First carry out the removal operations given in paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
1. Loosen the four screws securing the conveyor to the heating-distribution unit.
 2. Apply leverage to the tabs.
 3. Loosen the screws and remove the lines.
 4. Disconnect the electrical connectors from the electric fan.
 5. Disconnect the heating-distribution unit from the conveyor.

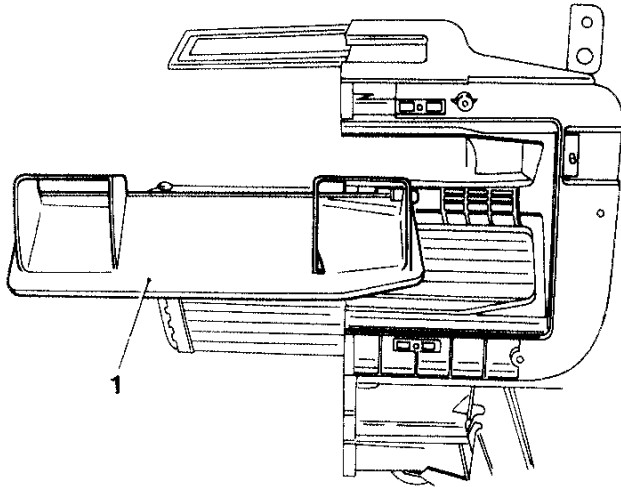


1. Loosen the screws securing the two casing halves of the heating-distribution unit and using a thin-bladed screwdriver apply leverage to the tabs.
2. Separate the two casing halves of the heating-distribution unit.





1. Remove the vent



Refitting

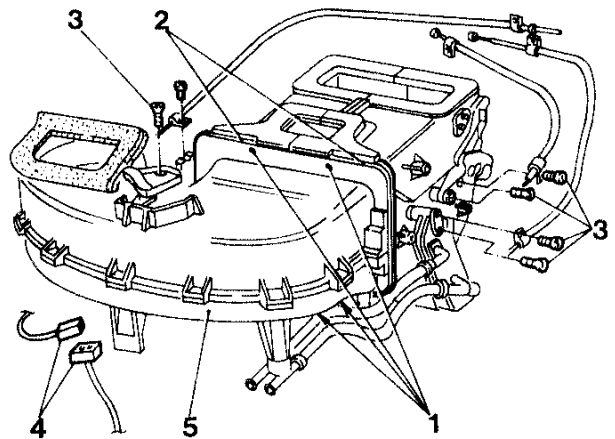


To refit, reverse the procedure followed for removal.

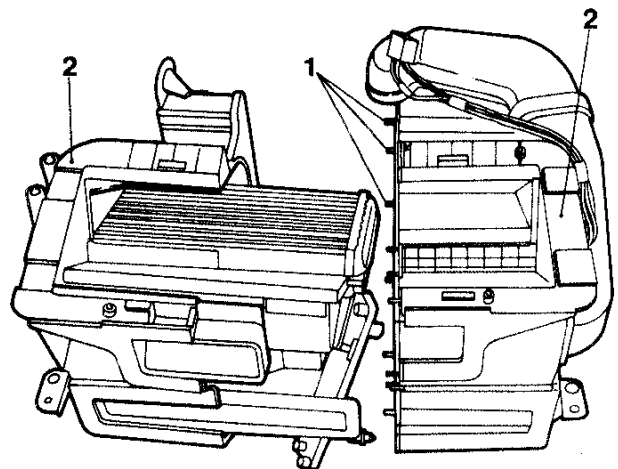
UPPER AIR DISTRIBUTION VENT

Removal

- First carry out the removal operations given in paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
1. Loosen the four screws securing the conveyor to the heating-distribution unit.
 2. Apply leverage to the tabs.
 3. Loosen the screws and remove the lines.
 4. Disconnect the electrical connectors from the electric fan.
 5. Disconnect the heating-distribution unit from the conveyor.

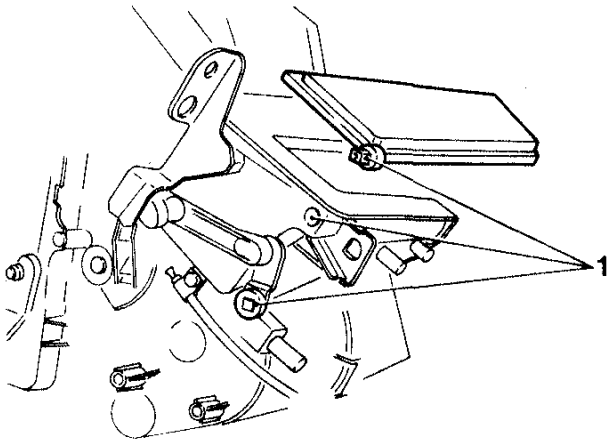


1. Loosen the screws securing the two casing halves of the heating-distribution unit and using a thin-bladed screwdriver apply leverage to the tabs.
2. Separate the two casing halves of the heating-distribution unit.





1. Remove the vent



Refitting

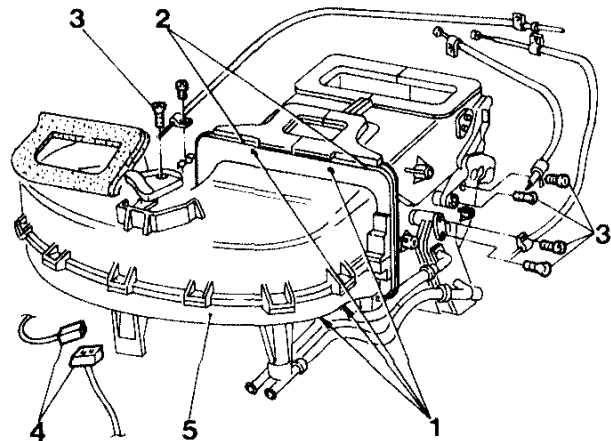


To refit, reverse the procedure followed for removal.

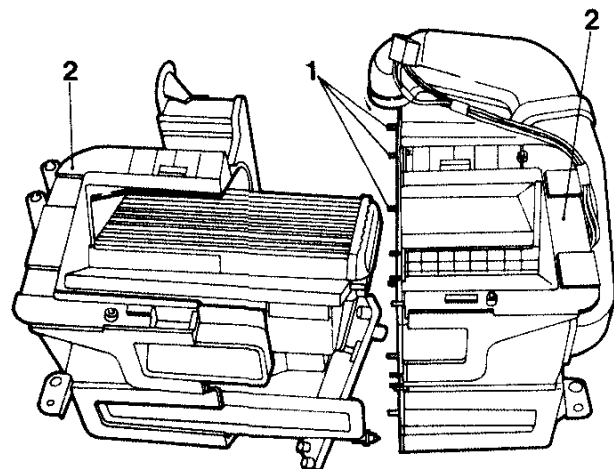
LOWER AIR DISTRIBUTION VENT

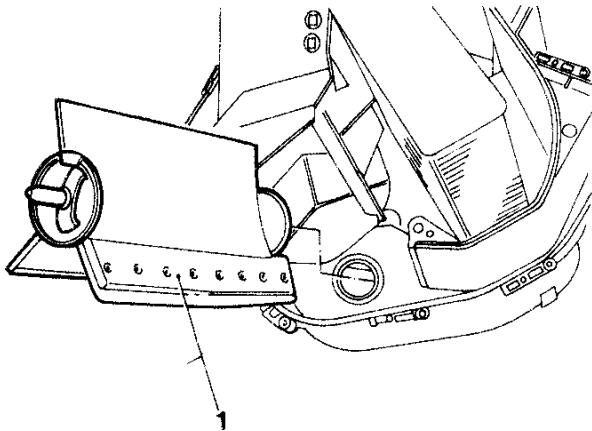
Removal

- First carry out the removal operations given in paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
- 1. Loosen the four screws securing the conveyor to the heating-distribution unit.
- 2. Apply leverage to the tabs.
- 3. Loosen the screws and remove the lines.
- 4. Disconnect the electrical connectors from the electric fan.
- 5. Disconnect the heating-distribution unit from the conveyor.



1. Loosen the screws securing the two casing halves of the heating-distribution unit and using a thin-bladed screwdriver apply leverage to the tabs.
2. Separate the two casing halves of the heating-distribution unit.

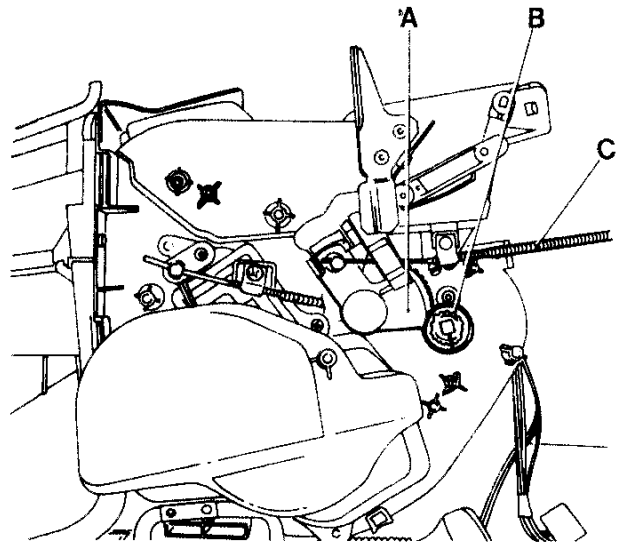


**1. Remove the vent****Refitting**

To refit, reverse the procedure followed for removal.

Supplementary information regarding refitting

- Gear (B) of the lower air distribution vent is directed by the sector wheel (A) which is in turn moved by the relative control line (C).
- When reassembling the heating-distribution unit, the raised white part on the sector wheel must be aligned to that on the gear forming part of the lower air distribution vent.



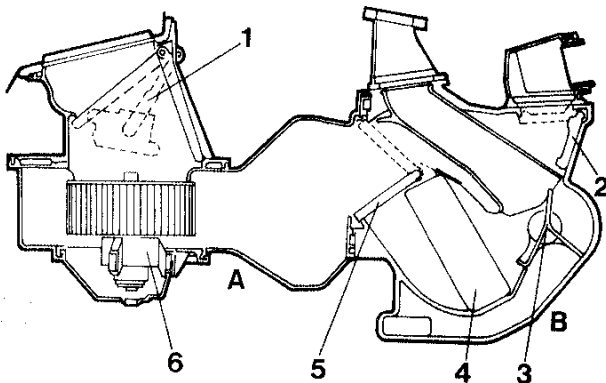


AUTOMATIC HEATER

DESCRIPTION OF THE SYSTEM

The automatic heater is composed of a single assembly and by an electronic control unit.

The assembly, shown diagrammatically in cross-section below, is composed of a conveyor (A) and by a heating-distribution unit (B).



- A. Conveyor
- B. Heating-distribution unit
- 1. Vent regulating outside air flow and recirculation
- 2. Upper air distribution vent
- 3. Lower air distribution vent
- 4. Heating/cooling radiator
- 5. Air mixing vent
- 6. Electric fan

The conveyor (A) can be divided into two parts, one upper and one lower. One end of the upper part is shaped so that it can be connected to the lower outside passenger compartment external compartment opening located under the windscreen.

In the upper front part of the conveyor there is a second opening which is in communication with the passenger compartment (air intake for the recirculation function).

A vent (1) is located between the two air intake openings inside the conveyor which can close off one of the two openings when suitably positioned.

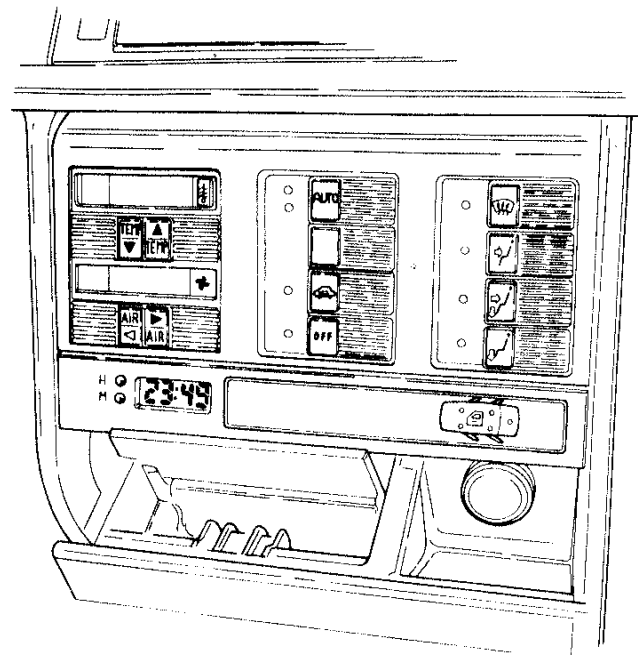
The vent is controlled by two levers and by an electronic actuator (motor) fixed to the outside of the conveyor.

A multiple-speed electric fan (6) is installed on the lower part of the conveyor near the air intake.

Two electric motors are fixed to the left-hand side of the heating-distribution unit which, via two levers, tie rods and a toothed section, position the distribution vents (2 and 3), the air mixing vent (5), at the same time as the tap control lever located on the inlet duct of the heating/cooling radiator (4).

The system is controlled by an electronic unit located on the central console (see diagram below).

On the front part of the unit there is panel with twelve buttons and two displays (see "ELECTRONIC CONTROL UNIT - FRONT PANEL").



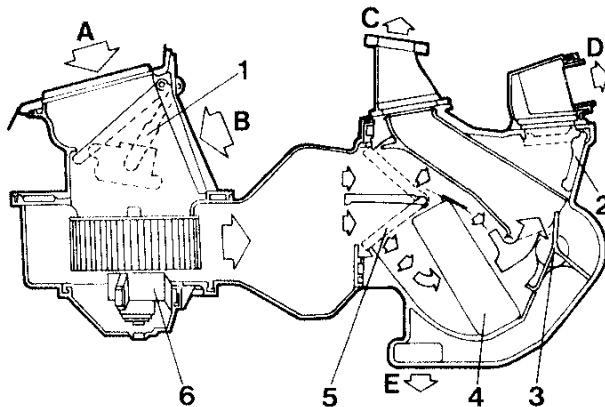


AIR-FLOW IN THE CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT

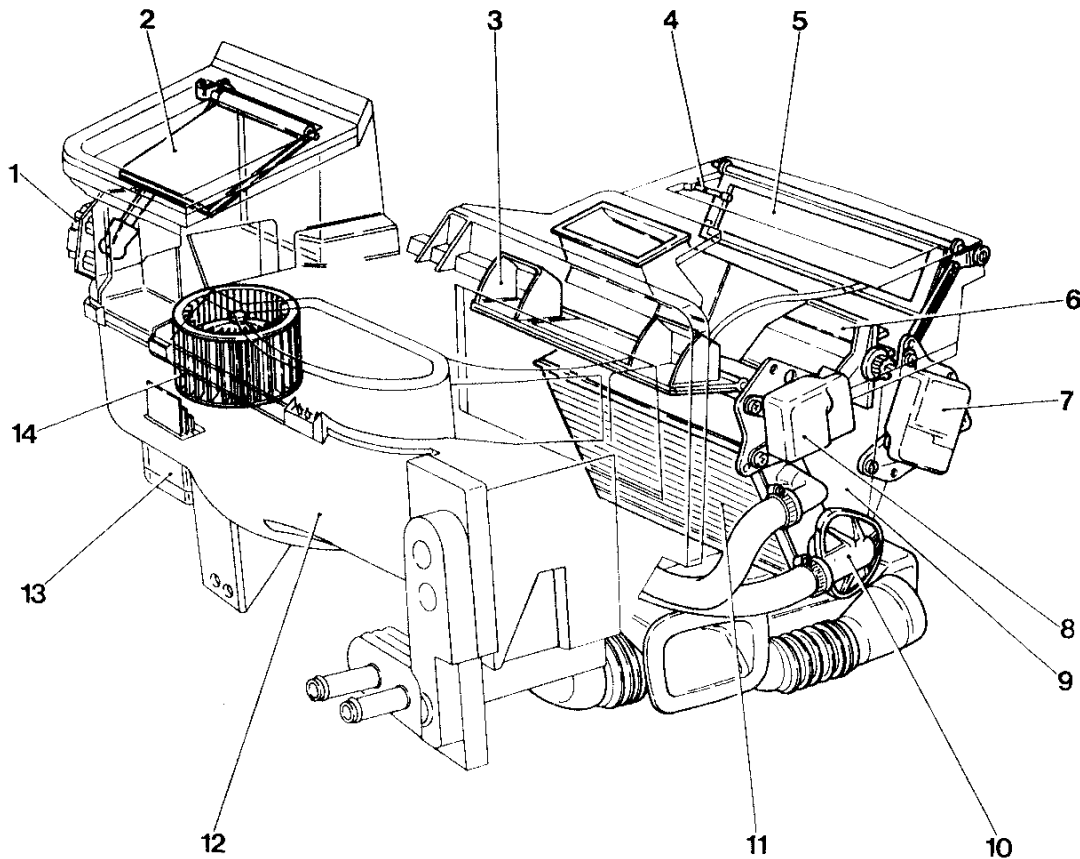
The outside air flow (A) (see diagram below) is conveyed to the heating-distribution unit via the motorized regulation vent (1) and the electric fan (6).

When the recirculation function is activated the flow of air comes directly from the passenger compartment (B). Depending on the position of the motorized air mixing vent (5), the flow of outside or recirculation air is conveyed either entirely to the motorized air distribution vents (2 and 3) or partially or entirely, via the heating/cooling radiator (4), to the air distribution vents (2 and 3).

Depending on the position of the upper (2) and lower (3) air distribution vents the flow of air is directed to the various outlets and diffusers in the passenger compartment.



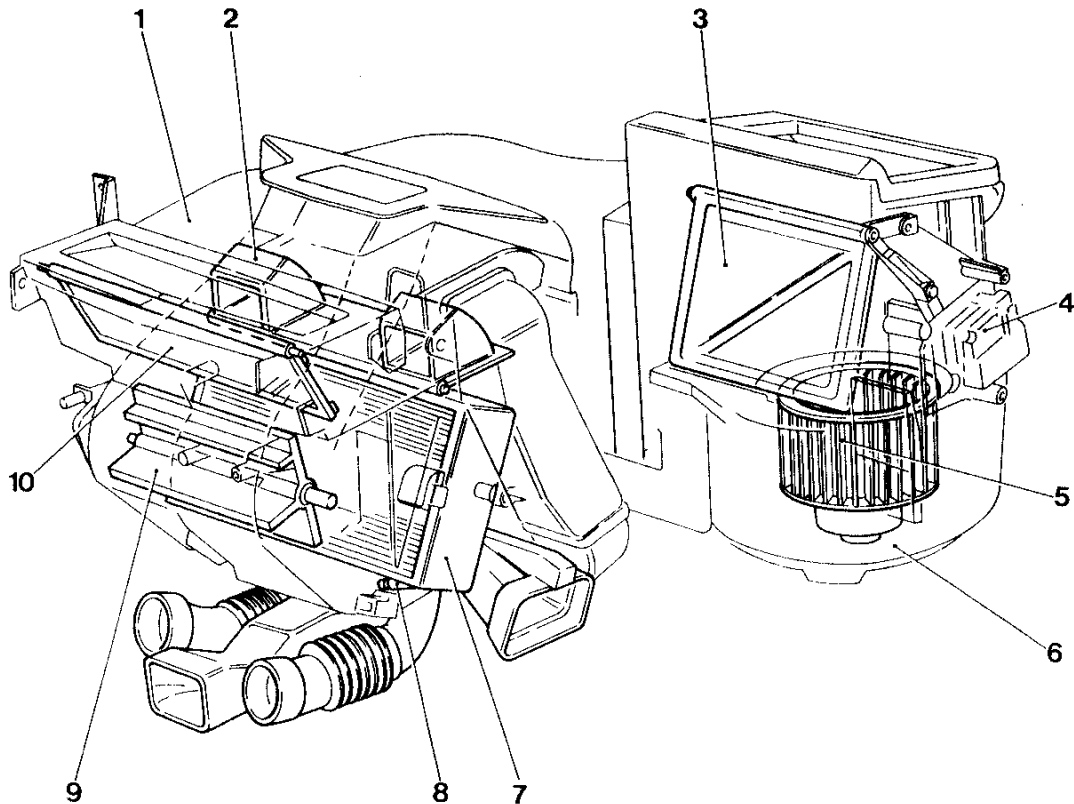
- A. Flow of outside air
- B. Flow of recirculation air
- C. Flow of air to the windscreen diffusers
- D. Flow of air to the front, central and side outlets
- E. Flow of air to the floor diffusers in the front and rear of the vehicle
- 1. Outside and recirculation air flow regulation vent
- 2. Upper air distribution vent
- 3. Lower air distribution vent
- 4. Heating/cooling radiator
- 5. Air mixing vent
- 6. Electric fan

**IDENTIFICATION AND POSITION OF THE COMPONENTS OF THE CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT (VIEW FROM ENGINE COMPARTMENT SIDE)**

- | | |
|--|--|
| <ol style="list-style-type: none">1. Electronic actuator controlling regulation of the outside and recirculation air flow2. Outside and recirculation air flow regulation vent3. Air mixing vent4. Upper air temperature sensor5. Upper air distribution vent6. Lower air distribution vent7. Electronic actuator controlling the upper and lower air distribution vents | <ol style="list-style-type: none">8. Electronic actuator controlling the air mixing vent and tap9. Heating-distribution unit10. Tap controlling the flow of engine coolant to the heating/cooling radiator11. Heating/cooling radiator12. Conveyor13. Electronic variator for the different fan speeds14. Electric fan |
|--|--|



IDENTIFICATION AND POSITION OF THE COMPONENTS OF THE CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT (VIEW FROM PASSENGER COMPARTMENT SIDE)



1. Heating-distribution unit
2. Air mixing vent
3. Outside and recirculation air flow regulation vent
4. Electric actuator controlling the outside and recirculation air flow regulation vent
5. Electric fan

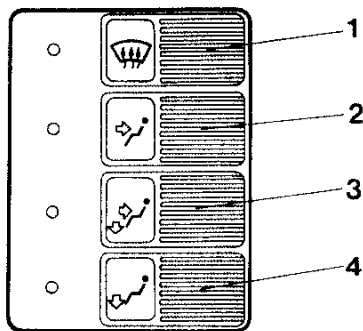
6. Conveyor
7. Heating/cooling radiator
8. Lower air temperature sensor
9. Lower air distribution vent
10. Upper air distribution vent



AIR-FLOW DISTRIBUTION IN THE PASSENGER COMPARTMENT

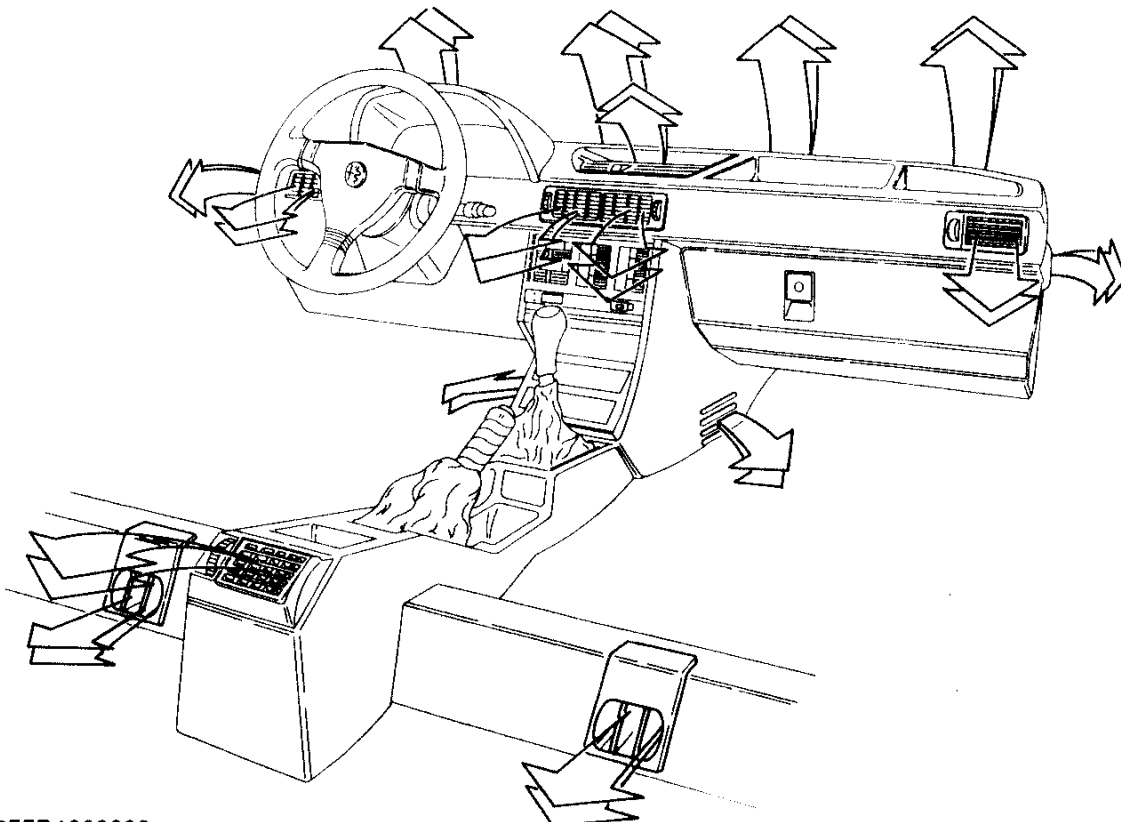
The ideograms identifying the right-hand buttons on the control panel of the system's electronic control unit (see diagram below) show diagrammatically in which direction the flow of external or recirculated air will leave the various outlets and diffusers in the passenger compartment.

Each button is fitted with a luminous led which comes on to signal that that particular position has been engaged.



1. Button selecting air distribution to the upper outlets and diffusers
2. Button selecting air distribution to the front outlets and diffusers
3. Button selecting air distribution to the front and lower outlets and diffusers
4. Button selecting air distribution to the lower outlets and diffusers

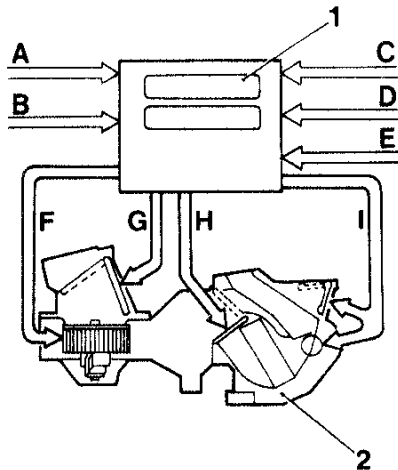
PASSENGER COMPARTMENT AIR OUTLETS AND DIFFUSORS





DESCRIPTION OF THE OPERATION OF THE SYSTEM'S ELECTRONIC CONTROL UNIT

The operation of the system is controlled by a control unit which, on the basis of the information transmitted to it (see diagram below), controls the speed of the electric fan via the electronic variator, and the positioning of the vents directing the flow of air.



- A. Outside air temperature
- B. Passenger compartment air temperature
- C. Mixed air temperature at the upper air distribution vent
- D. Mixed air temperature at the lower air distribution vent
- E. Speedometer signal
- F. To the electric fan speed control electronic variator
- G. To the air intake vent
- H. To the air mixing vent
- I. To the upper and lower air distribution vents
- 1. Electronic control unit
- 2. Conveyor assembly and heating-distribution unit

The four temperature values are communicated to the control unit by four sensors:

- outside air temperature sensor of the NTC type which protrudes from the lower surface of the left-hand door mirror;

- Passenger compartment air temperature sensor, of the NTC type, located in the inner part of the instrument panel under the control panel on the right-hand side of the steering wheel;
- two mixed air temperature sensors of the NTC type. One sensor is located in the upper part and one in the lower part of the heating-distribution unit on the right-hand side.

The microprocessor which controls the system is also equipped with an emergency program which is activated if a fault develops in one of the temperature sensors. In this event the logic of the microprocessor fixes the temperature values within the passenger compartment at a comfortable level.

The speedometer signal is communicated to the electronic control unit by the relative sensor which is installed on the gear box.

Depending on the air temperature values and the speed of the vehicle communicated by the sensors and the desired temperature value of the air within the passenger compartment, the electronic control unit:

- supplies power to the electric motor which, by way of two levers, two rods and a disk acting as a cam, moves the mixing vent to the required position and, at the same time, moves the tap located on the inlet duct of the heater to the correct degree of opening;
- supplies power to the electric actuator which directly rotates the lower air distribution vent and, by way of a toothed section with two levers, moves the upper air distribution vent to the required position;
- operates the electric fan at the required speed

The system can be activated whatever the environmental conditions outside the vehicle or differences in engine temperature.

To bring the temperature in the passenger compartment to the maximum degree of comfort in the shortest possible time the control unit, on the basis of measured values, the mixed air temperature and vehicle speed, adopts the strategy listed in the table on the following page when the ignition key is rotated from the STOP position to the MAR position.



MEASURED VALUE

STORED VALUE TAKEN INTO CONSIDERATION

1. Mixed air temperature below 40 °C
2. Mixed air temperature above 40 °C.
3. Vehicle speed below 30 Kph.
4. Vehicle speed above 30 Kph for at least one minute.

External air temperature is memorized.

The electronic control unit takes into consideration the outside air temperature memorized before the engine was switched off (key at STOP).

The outside air temperature is only updated if there is a decrease in relation to the value previously memorized when the ignition key was turned to the MAR position.

The outside air temperature value replaces the previously memorized value if there is an increase or decrease.

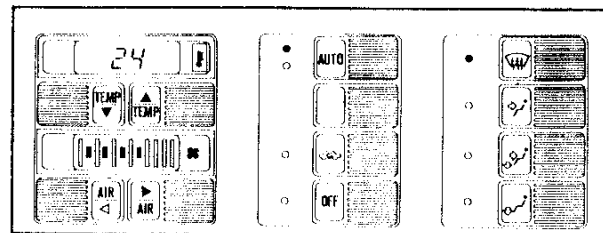
The second condition given in the table exists because, as the engine is still warm, the vehicle is considered to have been stationary only for a short while and that the environmental conditions are the same as those measured before the vehicle stopped.

The third condition given in the table exists to remedy the measurement of an artificial positive variation in the temperature of the outside air when the vehicle is in a queue or city traffic.

Each time the ignition key is turned from the MAR to the STOP position, the settings which were automatically or manually selected are memorized and will once again become operational when the ignition key is returned to the MAR position.

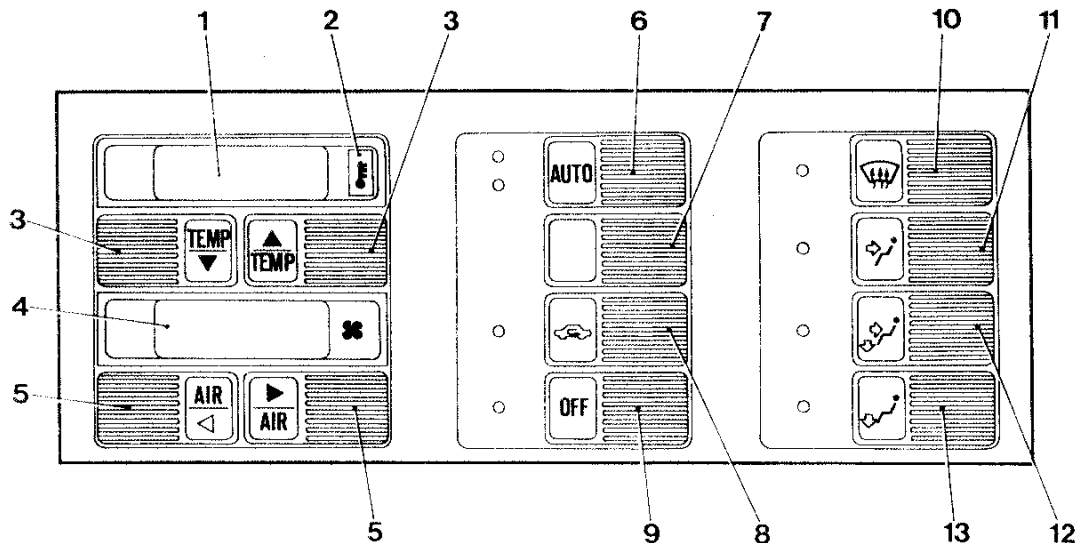
If the battery is disconnected for any reason and then reconnected after a certain period of time has elapsed, when the ignition key is rotated to the MAR position the indications given in the diagram on the right may appear on the control panel:

- Temperature setting on the display 24 °C or 72 °F (depending of the model of electronic control unit);
- illumination of the upper led next to the AUTO button;
- illumination of the leds regarding electric fan speed and automatically pre-selected air distribution.





FRONT PANEL OF ELECTRONIC CONTROL UNIT



1. Temperature display
2. External temperature display button
3. Buttons for setting temperature
4. Electric fan speed display
5. Buttons for setting fan speed
6. Automatic operation on/off button
7. Button not connected
8. Button for activation of passenger compartment air recirculation
9. Button to deactivate the system
10. Button for directing air flow to upper outlets and diffusers
11. Button for directing air flow to front outlets and diffusers
12. Button for directing air flow to the front and lower outlets and diffusers
13. Button for directing to the lower outlets and diffusers

By pressing button (9):

- the led relative to the button comes on;
- all the leds of the other buttons go out;
- the system is deactivated;
- the air distribution vents are locked in the last position selected;
- the air intake vents are rotated upwards in order to cut-off the flow of outside air.

Pressing any other button except button (2) actuates the function controlled by it and resets all the other operating conditions memorized by the electronic control unit before button (9) was pressed to deactivate the system. The system can also be reset by pressing button (9) a second time.

When the system is deactivated (button 9 on) it is possible to display the external air temperature by pressing button (2).

By pressing button (6) all other manual settings are cancelled and the system is then automatically controlled on the basis of the measured temperatures and those set on the display. The electronic control unit positions the various vents so that the maximum degree of comfort within the passenger compartment is reached in the shortest possible time.

Two leds next to button (6) come on to indicate the automatic operation of the system.

If one or more of the buttons are pressed (differing from those set automatically) to vary the air distribution and/or speed of the electric fan, the lower led next to button (6) goes out to indicate only partial operation of the automatic function.



If the led on button (8) comes on during the automatic functioning of the system, i.e. when the air recirculation is activated, by pressing this button air recirculation is shut off and outside air circulation is activated instead, indicated by the above mentioned led going out.

If button (8) is pushed when the relative led is out (circulation of external air), the led mentioned above will come on and the recirculation of passenger compartment air will be activated.

The recirculation function is also activated automatically by the system under particular conditions, for example, if the external air temperature is very high.

The two leds next to button (6) come on to indicate automatic functioning of the system but only the upper led comes on to indicate semi-automatic operation. The desired passenger compartment air temperature can be set by acting on button (3) and the value appears on the upper display (1).

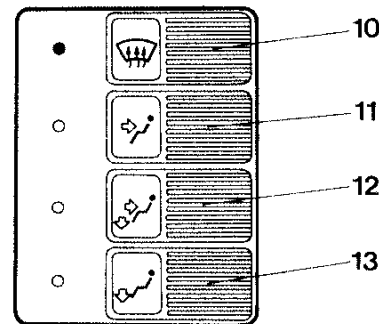
Each time one of the number (3) buttons is pressed only one unit of the temperature value will be varied on the display. The temperature value which can be set on the display can be chosen from between 18 °C and 32 °C or between 64 °F and 89 °F for control units set for degrees Fahrenheit.

When the displayed temperature value is 32 °C (or 89 °F) if the right-hand button is pressed (3) the letters HI will appear on the display. In this situation the system reverts to a fixed setting which supplies the highest temperature possible.

The speed of the electric fan is continuously controlled by the control unit and any variation is indicated on the display (4) by the progressive illumination of the 7 leds in addition to the first which is always on. By acting on button (5) the desired speed can be set and the previous manual or automatic setting is cancelled.

If the preceding fan speed was set automatically by the system, the lower led next to button (6) will go out when button (5) is pressed and the words MANUAL will light up.

Air distribution to the various outlets and diffusers is continuously controlled by the automatic function which rotates the two air distribution vents from the positions corresponding to button (10) to those corresponding to button (13) indicating its choice by illuminating the led on the relative button. During winter heating the automatic function can set the two air distribution vents to the angle corresponding to button (10).



By pressing one of the four buttons the automatically selected air distribution can be varied. If the fan speed or the recirculation function have not been varied the lower led next to the button goes out.

Pushing the button again will hand over control of the air distribution vents to the automatic function. Distribution of the air to the various outlets and diffusers can easily be seen by observing the direction of the arrows on the ideograms on each button.

By pushing button (2) located on the right-hand side of the upper display the external air temperature will appear on the upper display.

This value is distinguished by the letters EXT (external) and will stay on for about ten seconds after which the selected air temperature value within the passenger compartment will appear. The external air temperatures which can be indicated by the upper display range from -30 °C to 50 °C or from -22 °F to 122 °F.

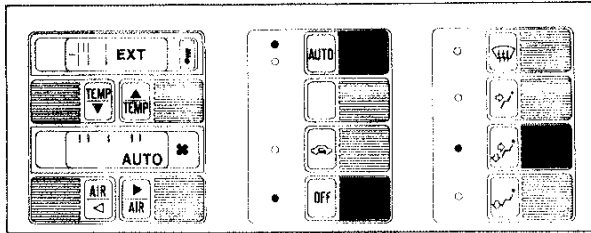


SELF-DIAGNOSIS

Follow the operations for each phase in order.

First phase

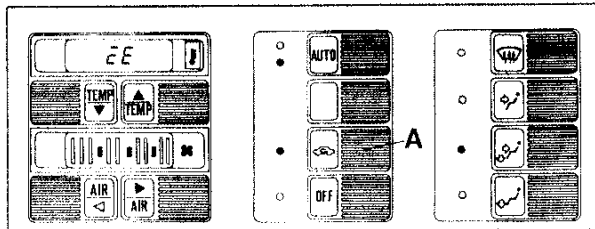
Rotate the ignition key from the STOP position to the MAR position at the same time holding the AUTO button in. The indications shown in the figure below should appear on the two displays and the leds of the buttons indicated by hatching should come on.



Push the button indicated by the letter A.

The indications represented in the figure below should appear on the two displays and the leds indicated should come on.

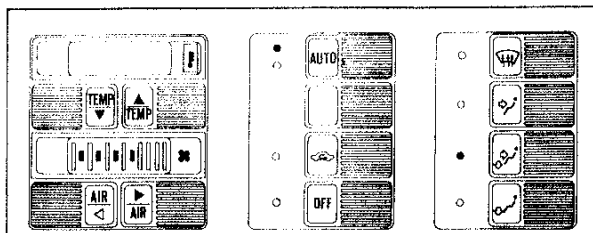
By pressing button A a second time the system returns to the previous condition.



Second phase

1. Press the AUTO button.

The indications illustrated in the figure below should appear on the lower display.



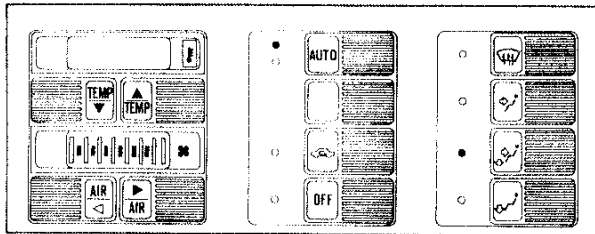
2. Press the various buttons illustrated in the table below in order and check that the relative code appears on the upper display for each one.

| BUTTON | RELATIVE CODE |
|--------|---------------|
| | 5 |
| | 6 |
| | 1 |
| | 2 |
| | 8 |
| | 7 |
| | 9 |
| | 6 |
| | 3 |
| | A |
| | E |

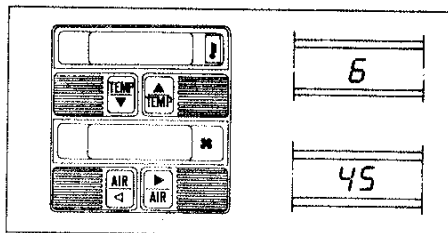


Third phase

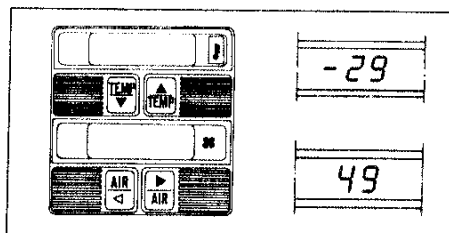
1. Press the AUTO button. The indications illustrated in the figure below should appear on the lower display (6 bars).



2. Press the AIR button with the arrow pointing left. The temperature inside the passenger compartment should appear on the upper display. A value of 06 or 6 indicates that the sensor or its circuit is interrupted. If the number 45 appears the sensor or the cables connected to it are short-circuiting.



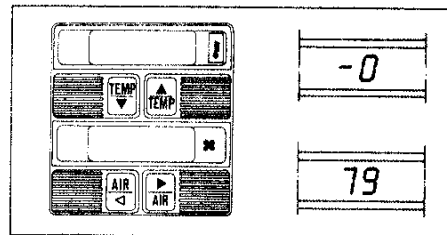
3. Press the AIR button with the arrow pointing right. The external air temperature should appear on the upper display. If the number 29 appears the sensor or its circuit are interrupted. If the number 49 appears the sensor or cables connected to it are short-circuiting.



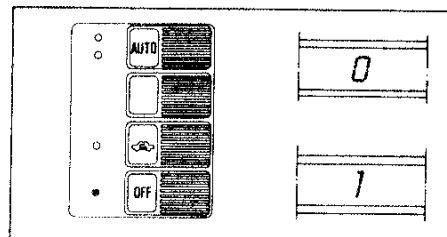
4. Press the TEMP buttons, first the one on the right and then the one on the left.

The mixed air temperature value measured in the upper and that of the lower parts respectively of the heating-distribution unit should appear on the upper display.

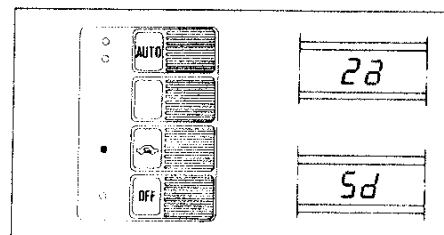
If for one of the two sensors a value of -00 or -0 appears, the sensor or its circuit is interrupted. If a value of 79 appears, the sensor in question or the cables connected to it are short-circuiting.



5. Press the OFF button. If the vehicle is stationary 0 should appear on the display or 1 if the vehicle is travelling at a speed above 30 Kph.

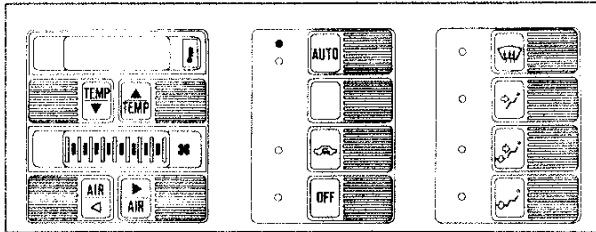


6. Press the air recirculation button. A value between 2a and d5 should appear on the upper display. This value represents the position of the air distribution vents.

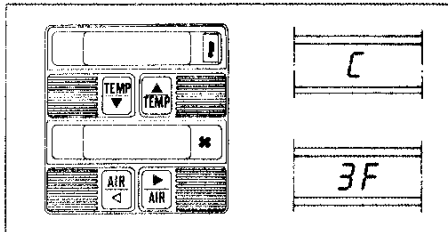


**Fourth phase**

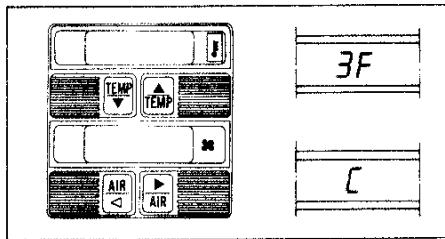
1. Press the AUTO button. The indications illustrated in the figure below should appear on the lower display (8 bars).



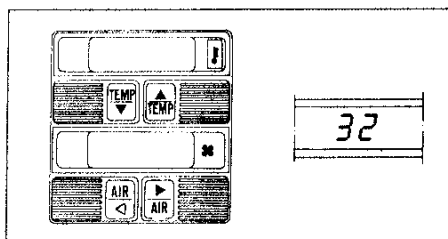
2. By repeatedly pressing the right-hand AIR button 26 codes, from C to 3F, should appear in sequence on the display and the electric fan should be heard to gradually increase in speed.



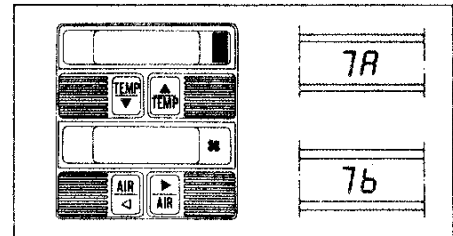
3. By repeatedly pressing the left-hand AIR button 26 codes, from 3F to C, should appear in sequence on the display and the electric fan should be heard to gradually decrease in speed.



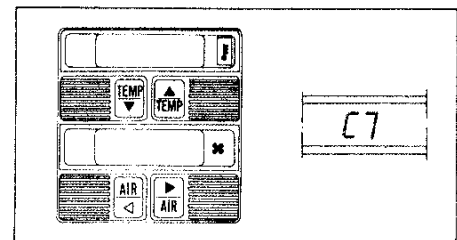
4. Press the left-hand TEMP button. A series of codes up to a maximum of 32 should appear on the display. These codes identify the maximum cold position of the mixed air vent (engine coolant tap closed).



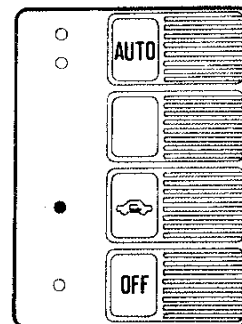
5. Press the button indicated by the hatching in the figure below. A sequence of codes up to a maximum of 7A or 7b should appear on the display. These codes correspond to the total opening of the tap on the inlet duct of the heater and to the maximum cold position of the air mixing vent.



6. Press the right-hand TEMP button. A series of codes up to a maximum of C7 should appear on the display. These codes identify the maximum heat position of the mixed air vent (engine coolant tap fully open).



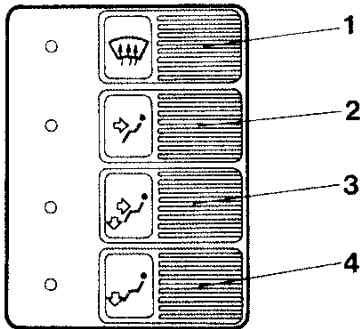
7. By pressing the recirculation button, the led on the button should come on and the air recirculation function should be activated.



8. Pressing the recirculation button a second time should extinguish the relative led and the circulation of external air should be activated.



9. Press buttons 1 - 4 in succession. For each button the relative led should come on and a sequence of codes should appear on the upper display until they remain stationary for each button. This will indicate a specific position of the air distribution vents.



The codes connected to each button are given in the table below.

| BUTTON | RELATIVE CODE |
|--------|---------------|
| | 85 |
| | 26 |
| | 62 |
| | 94 |

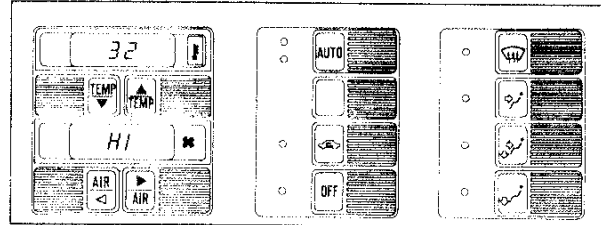
After this last self-diagnosis operation press the AUTO button to return the system to normal operation.

MEMORY CONTROL

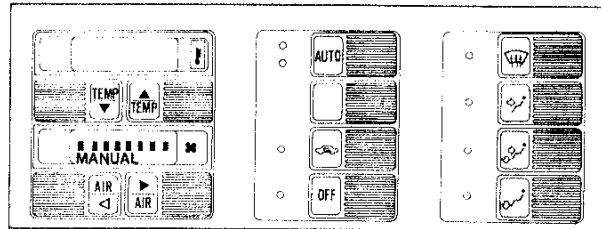
1. Turn the ignition key to the MAR position.
2. Press the AUTO button.

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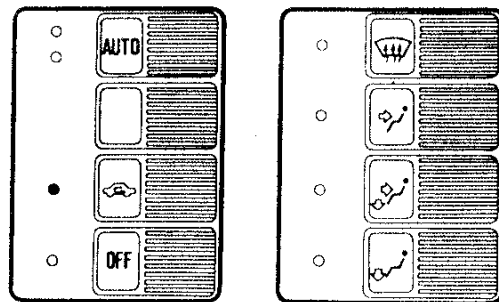
3. Repeatedly press the right-hand TEMP button until the lower display, electric fan speed, shows the letters HI.



4. Press the right-hand AIR button until the maximum speed of the electric fan is reached and 8 bars appear on the lower display.



5. Press the recirculation button and one of the buttons of the right-hand column, different from that selected automatically.



6. Turn the ignition key to the STOP position and then, after a few moments, return it to the MAR position. The previously selected settings which have been memorized must return to the operational state without variation, i.e., the set temperature HI, maximum fan speed, air recirculation and a certain distribution.

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OPERATIONS TO BE CARRIED OUT ON THE BASIS OF THE RESULTS OBTAINED FROM THE SELF-DIAGNOSIS TESTS

If one or more of the segments or one or more of the leds relative to the buttons stays out, or the codes relative to each button do not appear during the first and second phases of the self-diagnosis test, replace the electronic control unit. Refer to the table below for the third phase of the self-diagnosis:

| BUTTON | DISPLAYED DATA | OPERATION TO BE CARRIED OUT | DISPLAYED DATA | OPERATION TO BE CARRIED OUT |
|------------------------|---|--|----------------|-----------------------------|
| LEFT-HAND AIR BUTTON | Passenger compartment air temperature differs by $\pm 1^{\circ}\text{C}$ from the actual temp. | Replace the sensor and if the anomaly persists replace the electronic unit | | |
| | 6 | 6 A | C 45 | Replace the sensor |
| | 45 | B | 6 45 | Replace the sensor D |
| | | | | |
| RIGHT-HAND AIR BUTTON | External air temperature differs by $\pm 1^{\circ}\text{C}$ from the actual temp. | Replace the sensor and if the anomaly persists replace the electronic unit | | |
| | -29 | A | -29 49 | C Replace the sensor |
| | 49 | B | -29 49 | Replace the sensor D |
| | | | | |
| LEFT-HAND TEMP BUTTON | Air temperature in the upper part of the heating-distribution unit differs by $\pm 1^{\circ}\text{C}$ from the actual temp. | Replace the sensor and if the anomaly persists replace the electronic unit | | |
| | -0 | A | -0 79 | C Replace the sensor |
| | 79 | B | -0 79 | Replace the sensor D |
| | | | | |
| RIGHT-HAND TEMP BUTTON | Air temperature in the lower part of the heating-distribution unit differs by $\pm 1^{\circ}\text{C}$ from the actual temp. | Replace the sensor and if the anomaly persists replace the electronic unit | | |
| | -0 | -0 A | C 70 | Replace the sensor |
| | 79 | B | -0 79 | Replace the sensor D |
| | | | | |



- A. Disconnect the electrical connection from the terminal cables of the sensor and, using a jumper connection, connect the two cables supplying the sensor.
- B. Disconnect the electrical connection from the terminal cables of the sensor.
- C. Replace the interrupted cable or cables connecting the sensor to the control unit and replace the control unit if no interruption is found.
- D. Check and/or replace the positive cable which may have been accidentally connected to earth. If no anomalies are found replace the electronic unit.
- E. Replace the electronic speed variator of the electric fan.

In the fourth phase of the self-diagnosis a few anomalies may be encountered, namely:

- electric fan not running at all speeds;
- electric actuators not working or partly working;
- electric actuators working perfectly but codes differing from those stated appear on the display.

In the first situation check the power supply to the electric fan.

In the second situation check the efficiency of the actuators and if they are working correctly replace the electric unit after checking the integrity and insulation of the cables connecting the two parts.

In the third situation, if the number of codes appearing in sequence on the display is equal to the number which should appear, adjust the micrometric regulation screws on the position transducer.

NOTE: This last operation must be carried out only if the codes differ by only one unit. In all other cases replace the affected actuator.



REMOVAL AND REFITTING



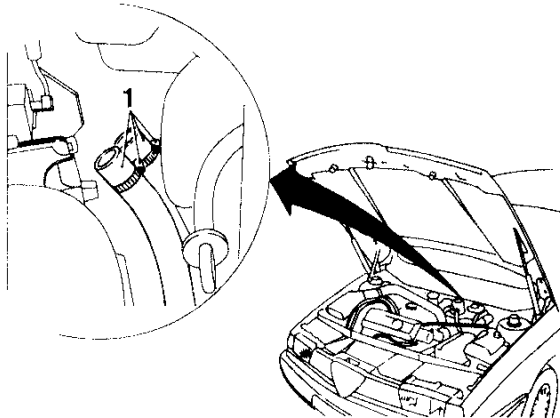
WARNING

Disconnect the negative cable from the battery before carrying out any work.

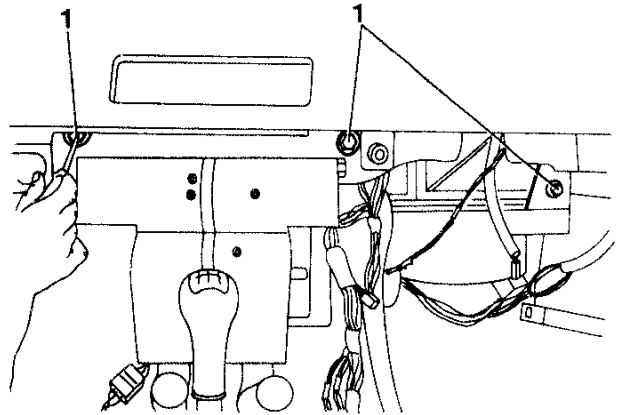
CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT

Removal

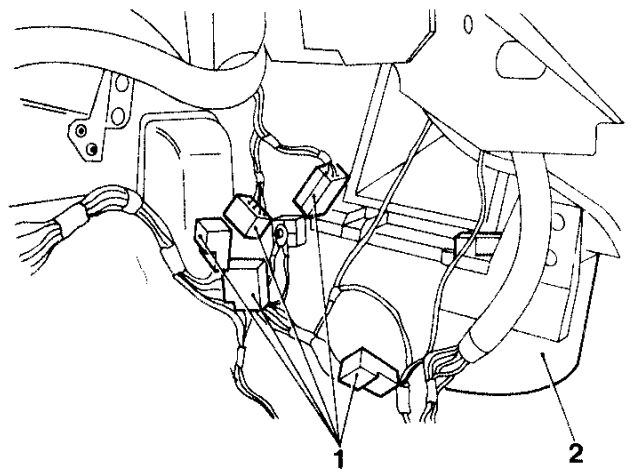
- Disassemble and remove the tunnel console (see GROUP 66).
 - Disassemble and remove the control unit (see relative paragraph).
 - Disassemble and remove the dashboard skirting (see GROUP 66).
1. Loosen the metal clamps supporting the two rubber delivery and return hoses carrying the engine coolant to the heating/cooling radiator.



1. Loosen the screws securing the unit to the body.



1. Disconnect all the electrical connections including the earths.
2. Remove the assembly paying close attention to the gasket on the upper air duct in the dashboard compartment.



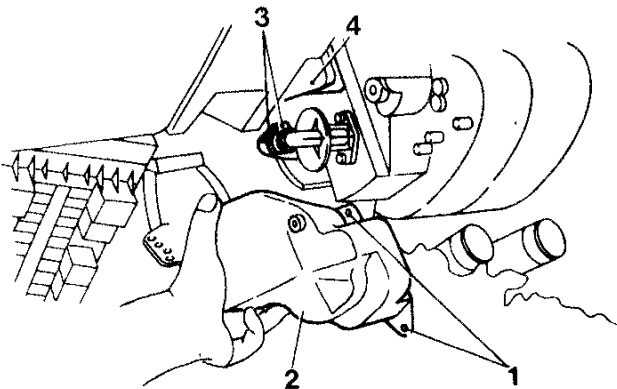
Refitting



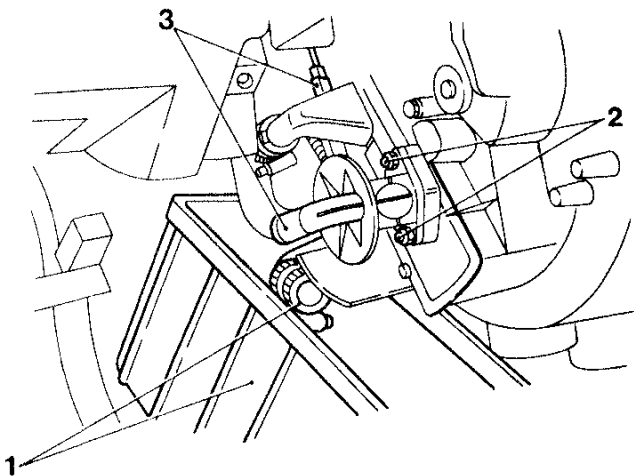
To refit, reverse the procedure followed for removal.

**HEATING/COOLING RADIATOR****Removal**

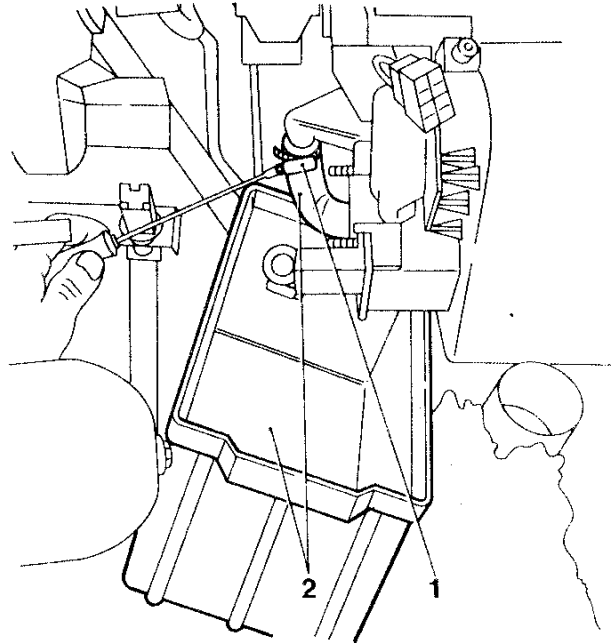
1. Loosen the two screws securing the cover to the heating/cooling radiator to the left of the conveyor assembly (driver's side).
2. Remove the cover.
3. Loosen the two clamps securing the engine coolant inlet hose to the tap.
4. Loosen the three screws securing the actuator to the assembly and remove the assembly.



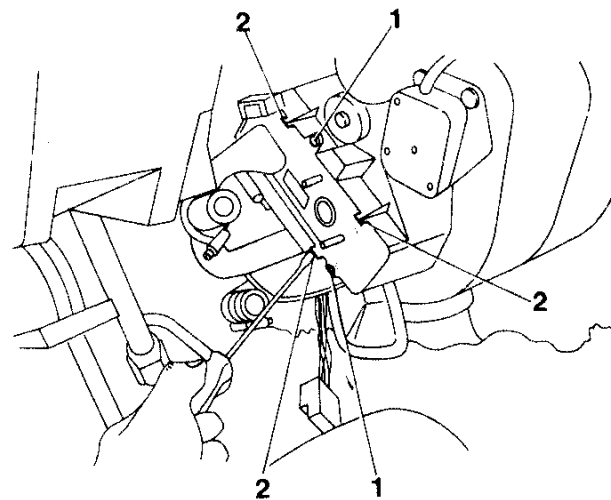
1. Disconnect the hose from the tap taking care not to spill any fluid. Use a container to catch any drips.
2. Loosen the two nuts securing the tap to the radiator.
3. Remove the tap together with the relative control levers.



1. Loosen the clamp securing the upper engine coolant from radiator outlet hose.
2. Disconnect the hose taking care not to spill any fluid. Use a container to catch any drips.

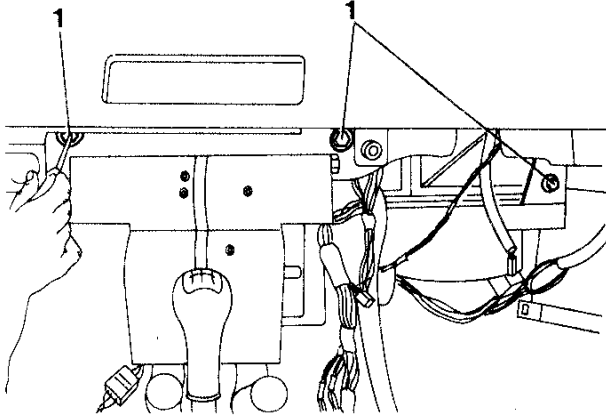


1. Loosen the two screws securing the heating/cooling radiator to the assembly.
2. Unclip the retaining tabs.





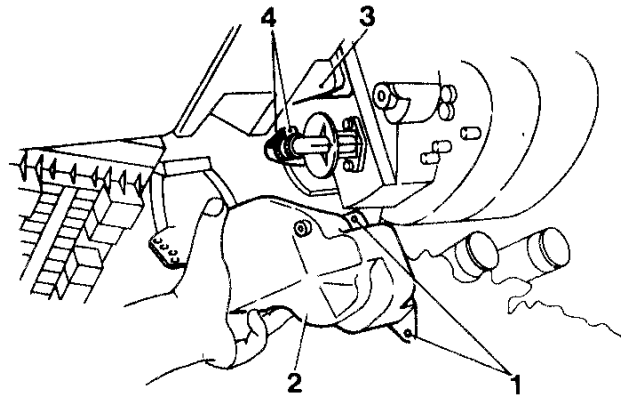
1. Loosen the upper screws securing the conveyor assembly to the frame. Withdraw the radiator from the driver's side, pushing both the assembly and the main fusebox downwards slightly.

**Refitting**

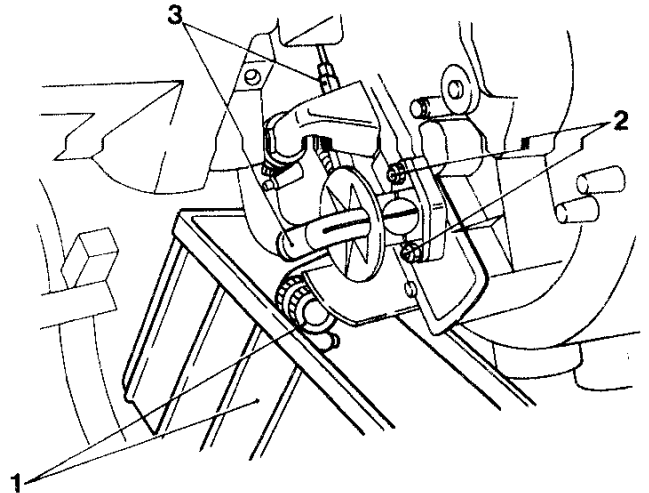
To refit, reverse the procedure followed for removal.

TAP REGULATING FLOW OF COOLANT INTO THE HEATING/COOLING RADIATOR**Removal**

1. Unscrew the two screws securing the cover to the heating/cooling radiator to the left of the conveyor assembly (driver's side).
2. Remove the cover.
3. Loosen the three screws securing the tap actuator to the assembly and remove it.
4. Loosen the two clamps securing the engine coolant inlet hose to the tap.



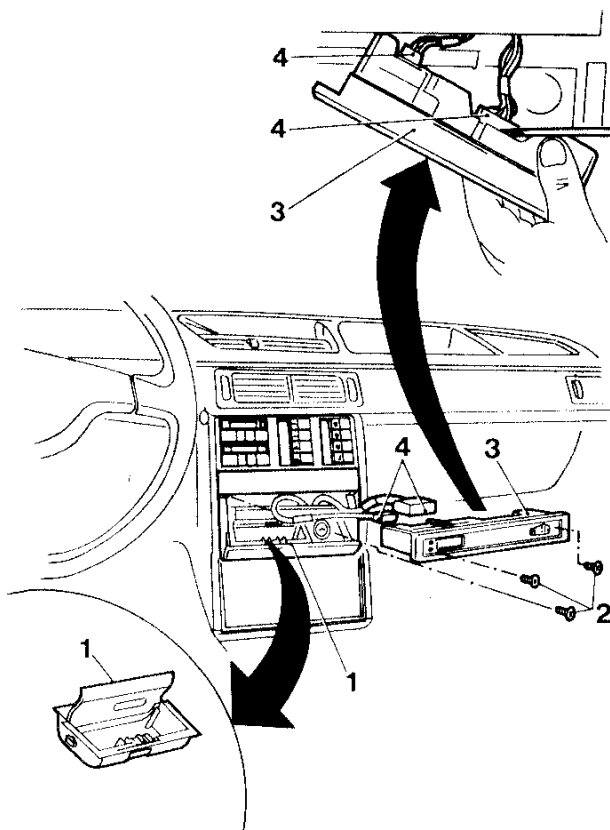
1. Disconnect the hose from the tap taking care not to spill any fluid. Use a container to catch any drips.
2. Loosen the two nuts securing the tap to the radiator.
3. Remove tap together with the relative control levers.

**Refitting**

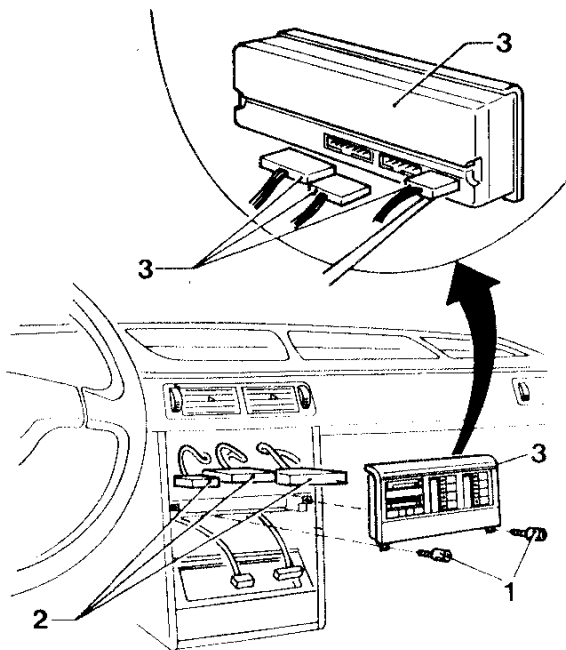
To refit, reverse the procedure followed for removal.

**ELECTRONIC CONTROL UNIT****Removal**

1. Remove the ashtray.
2. Loosen the three screws securing the Check Panel.
3. Pull out the Check Panel.
4. Disconnect the connectors and remove the Check Panel.



1. Loosen the two screws securing the control unit to the front covering of the central console.
2. Disconnect the three connectors from the control unit.
3. Remove the control unit.



2.5 + 5.9 Nm
(0.25 + 0.6 kgm)

Refitting

To refit, reverse the procedure followed for removal.

Supplementary Information regarding refitting

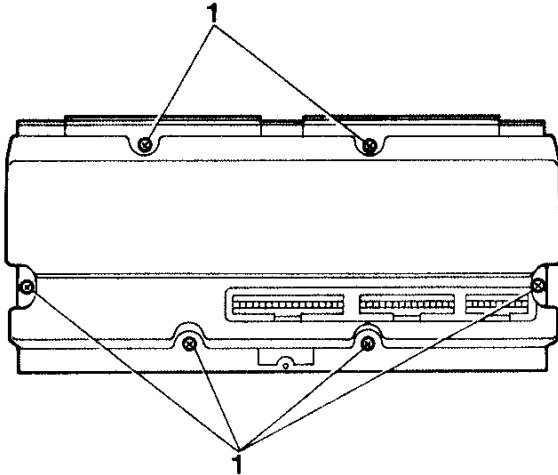
- Tighten the screws to the correct torque.



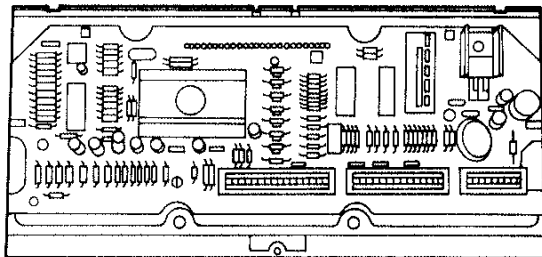
DISASSEMBLY OF THE ELECTRONIC CONTROL UNIT

Disassembly

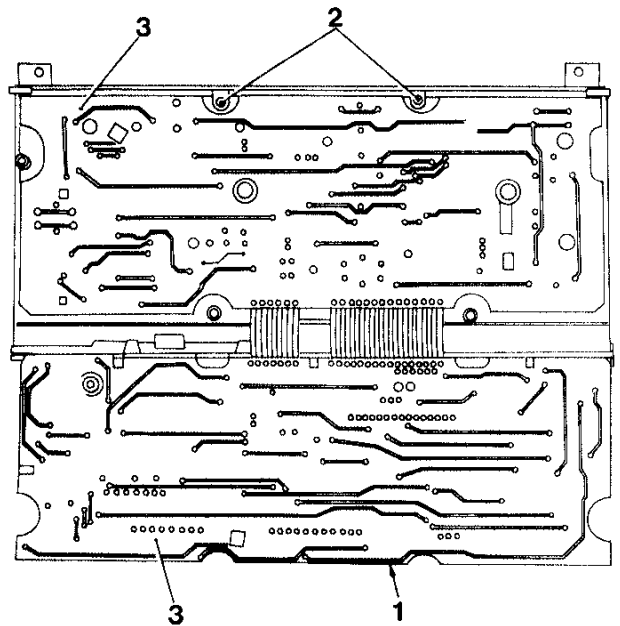
1. Loosen the screws securing the rear cover.



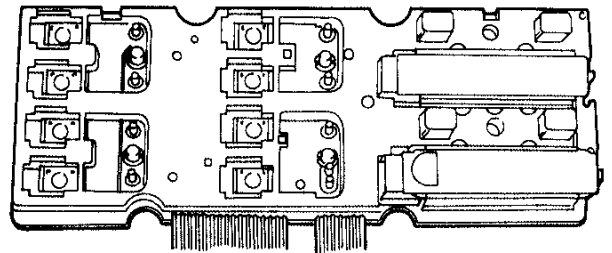
Detail of the rear side of the electronic control unit with cover removed.



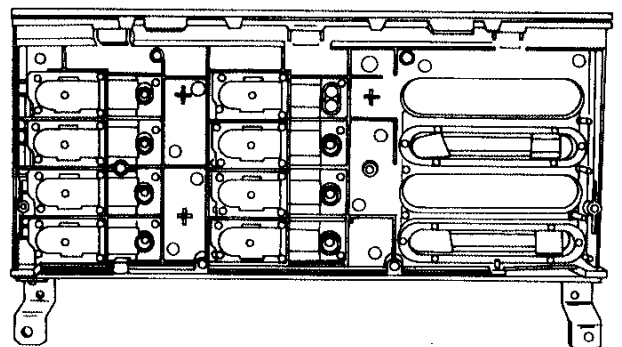
1. Tip the first printed circuit outwards.
2. Loosen the screws securing the second printed circuit to the control unit moulding.
3. Remove the two printed circuits from the control unit moulding.



Detail of the reverse side of the second printed circuit.



Detail showing rear side of moulding.

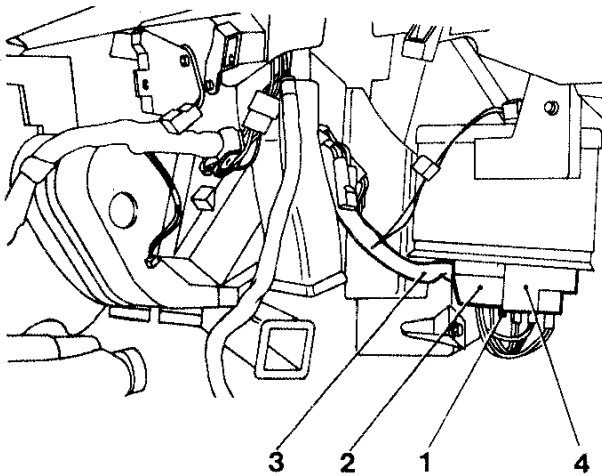


Reassembling the electronic control unit

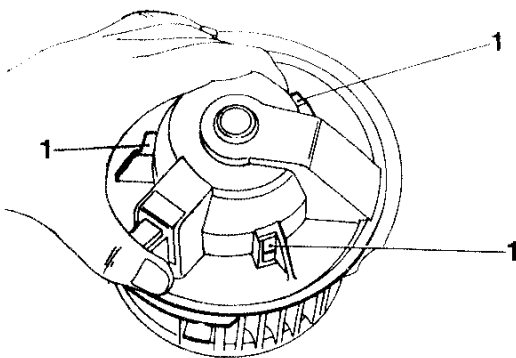
To reassemble, reverse the procedure followed for disassembly.

**ELECTRIC FAN****Removal**

- Working through the compartment below the dashboard, on the right-hand side, proceed as follows.
- 1. Using a thin-bladed screwdriver raise the tab.
- 2. Rotate the rear block of the fan a few degrees anticlockwise.
- 3. Disconnect the electric fan power supply connector.
- 4. Remove the fan block.



- 1. Using a screwdriver, press the three rubber clips on the fan and remove the cover.

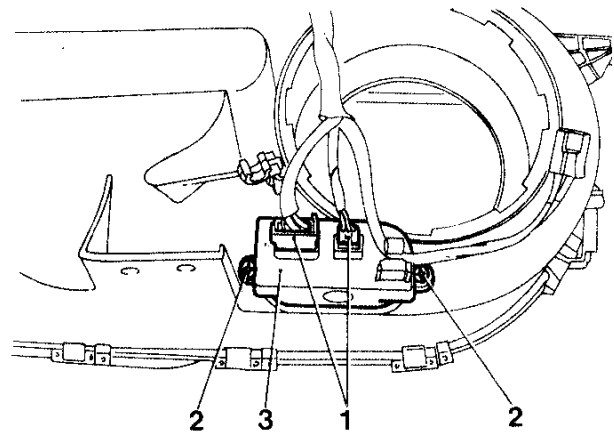
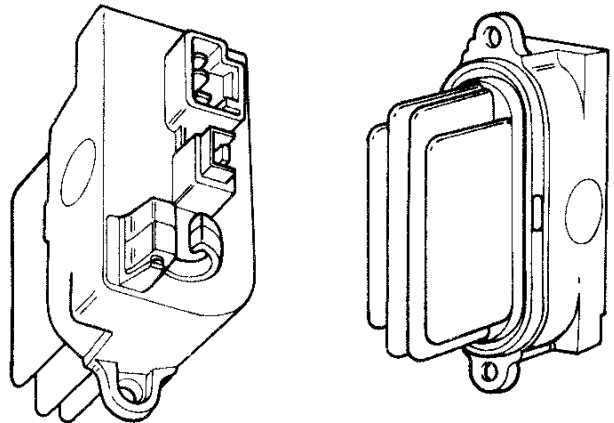
**Refitting**

To refit, reverse the procedure followed for removal.

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ELECTRONIC FAN-SPEED VARIATOR WITH BUILT-IN TEMPERATURE SENSOR**Removal**

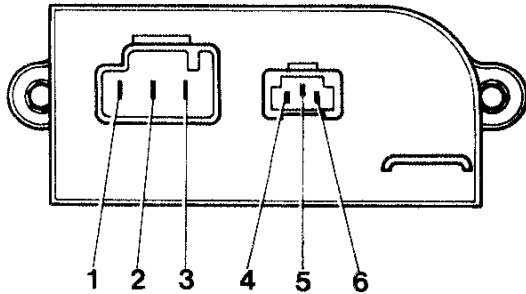
- Working through the compartment below the dashboard, on the right-hand side, proceed as follows.
- 1. Disengage the two electrical connectors from the variator.
- 2. Loosen the two screws securing the variator to the lower part of the heating-distribution unit in the housing indicated by the arrow.
- 3. Remove the variator.

**Detail of the variator**

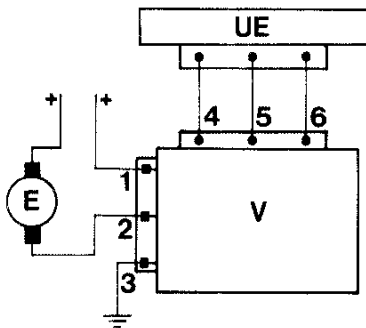
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Detail showing the connector socket on the variator (refer also to wiring diagram)



Wiring diagram showing connections to variator



UE. Electronic control unit
E. Electric fan
V. Speed variator

Refitting

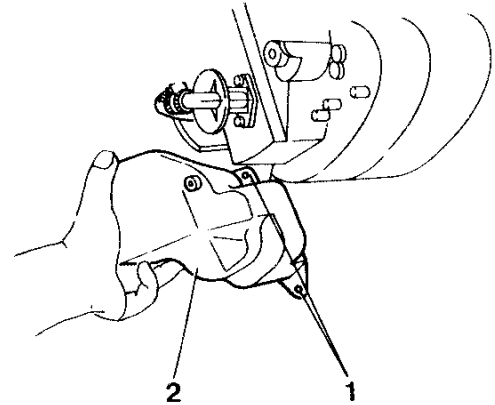


To refit, reverse the procedure followed for removal.

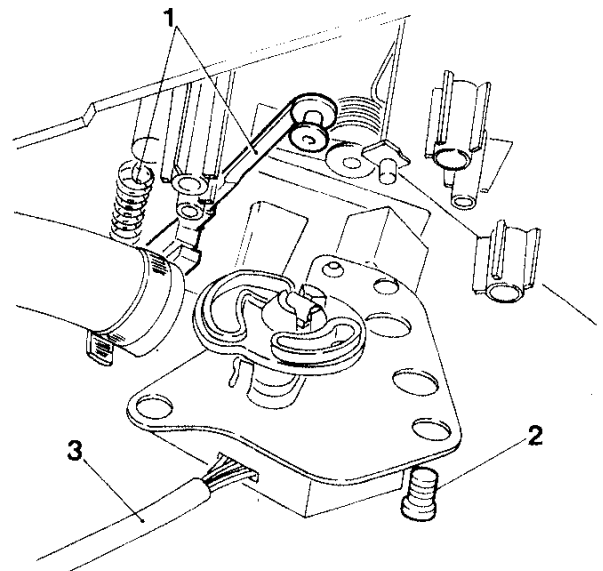
ELECTRIC MOTOR CONTROLLING TAP AND AIR MIXING VENT

Removal

- First proceed with the removal operations given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
- 1. Loosen the two screws securing the radiator cover.
- 2. Remove the cover.

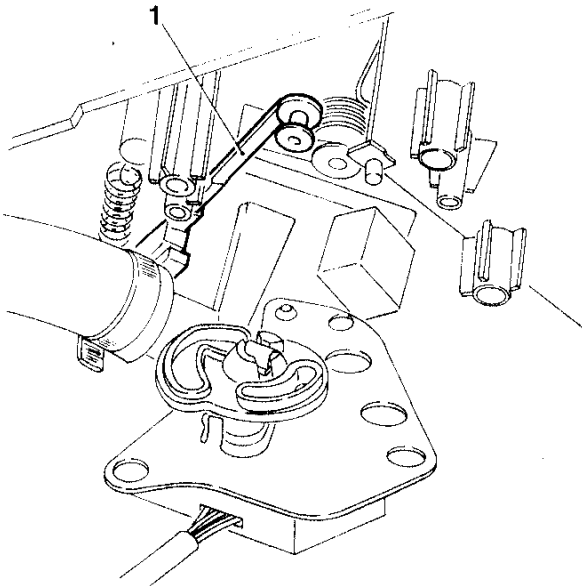


1. Unhook the tie-rod retaining spring.
2. Loosen the screws securing the plate and electronic actuator to the left-hand side wall of the conveyor.
3. Disconnect the electrical connector.





1. Disengage the tie-rod from the disk fitted inside the actuator shaft.



- A. Supply position corresponding to the closed position of the tap
- B. Position corresponding to the tap in the open position and the air mixing vent in the closed position
- C. Position corresponding to the tap in the open position and the air mixing vent fully open.
- K. = $15^\circ \pm 30'$
- Y. = 85°
- Z. = $170^\circ + 175^\circ$

Refitting



To refit, reverse the procedure followed for removal.

Actuator wiring diagram

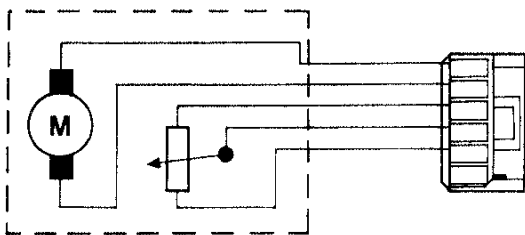
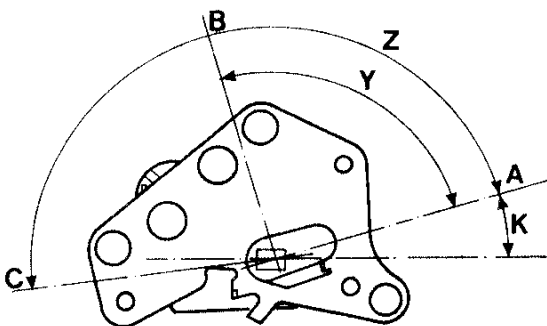


Diagram showing the positions of the lever installed on the actuator shaft, supplied as a spare part, corresponding to the closure of the tap.

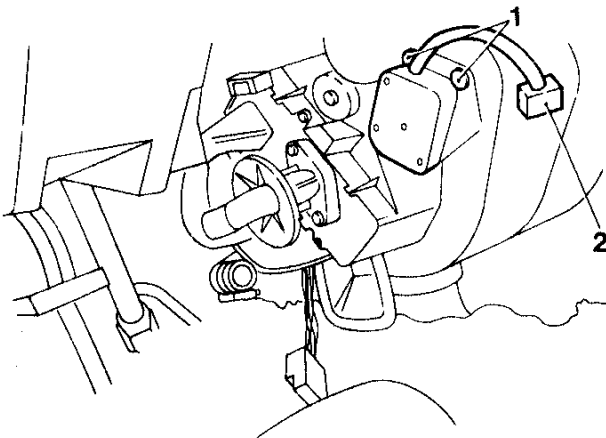




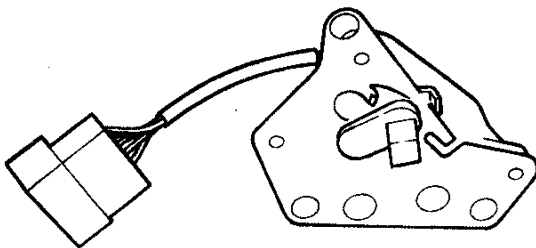
ELECTRIC MOTOR CONTROLLING THE UPPER AND LOWER AIR DISTRIBUTION VENTS

Removal

- Working on the left-hand side of the automatic heater under the dashboard (driver's side), proceed as follows.
- 1. Loosen the screws securing the plate and actuator to the left-hand side wall of the heating-distribution unit.
- 2. Disconnect the electrical connector.



Detail of the actuator



Actuator wiring diagram

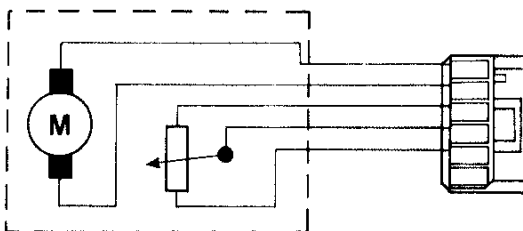
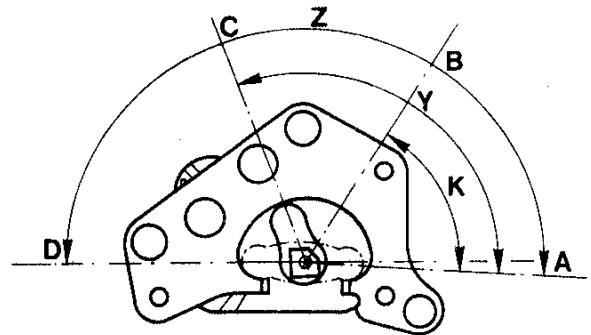


Diagram showing the position assumed by the lever installed on the actuator corresponding to the different types of air distribution



- A. Position corresponding to the the direction of air to the front, central and side outlets
- B. Position corresponding to the direction of air to the floor and to the front, central and side outlets
- C. Supply position corresponding to the direction of air to the floor
- D. Position corresponding to the direction of air to the windscreen diffusers
- K. Angle between positions A and B = 60°
- Y. Angle between positions A and C = $113^\circ \pm 1^\circ$
- Z. Angle between the positions A and D = $183^\circ + 185^\circ$

Refitting



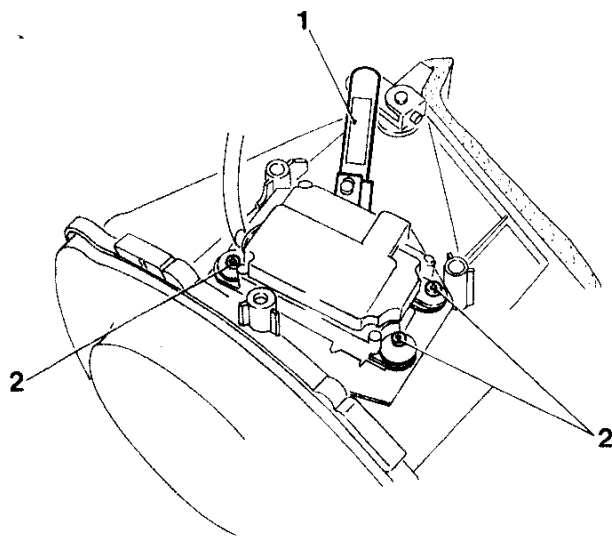
To refit, reverse the procedure followed for removal.



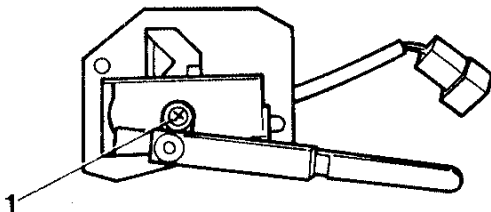
ELECTRIC MOTOR CONTROLLING THE VENT CLOSING OFF THE FLOW OF EXTERNAL AIR (RECIRCULATION)

Removal

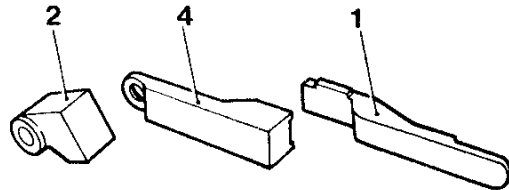
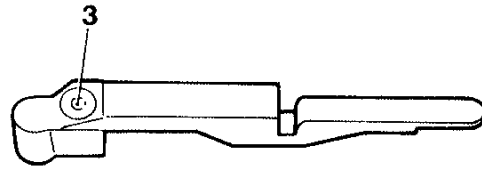
- First carry out the removal procedure given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
- 1. Disengage the upper tie-rod from the air intake vent lever.
- 2. Loosen the screws securing the plate and actuator to the heating-distribution unit.



- 1. Loosen the screw securing the control lever to the actuator.

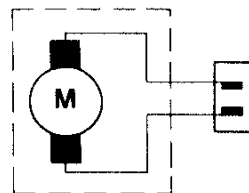


Details showing the air intake vent levers and tie-rods.

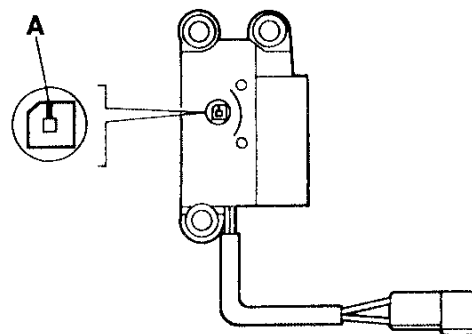


- 1. Upper tie-rod
- 2. Lever
- 3. Screw uniting the lever to the lower tie-rod
- 4. Lower tie-rod

Actuator wiring diagram



The actuator supplied as a spare part has a reference notch (A) located in the position shown.



Refitting



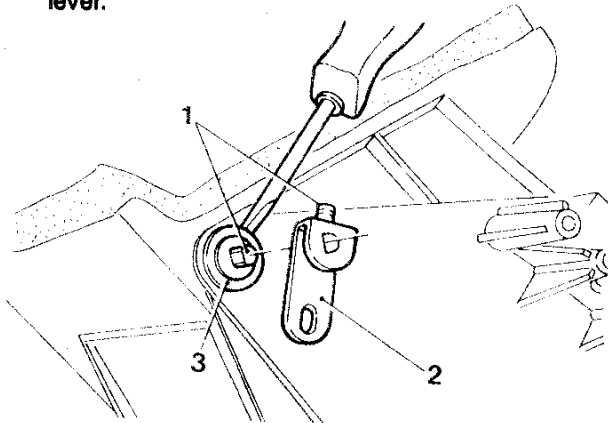
To refit, reverse the procedure followed for removal.



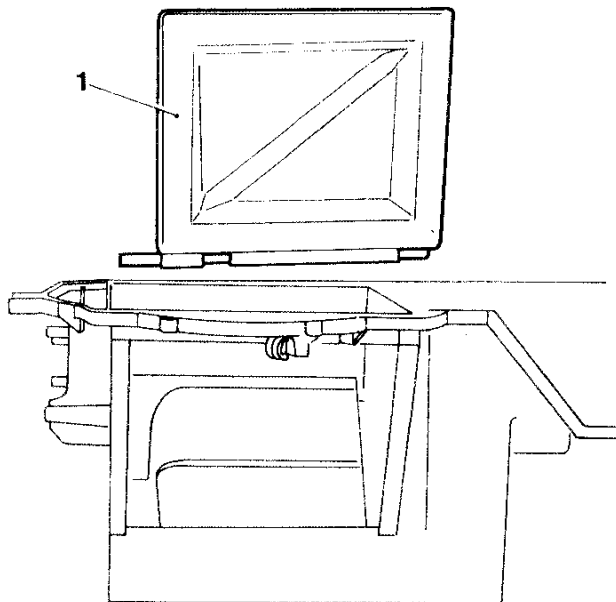
VENT SHUTTING OFF EXTERNAL AIR FLOW (RECIRCULATION)

Removal

- First carry out the removal procedure given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
1. Loosen the screw of the bracket fixed to the pin of the vent and actuator.
 2. Remove the bracket.
 3. Remove the rubber gasket using a screwdriver as a lever.



1. Remove the vent.



Refitting



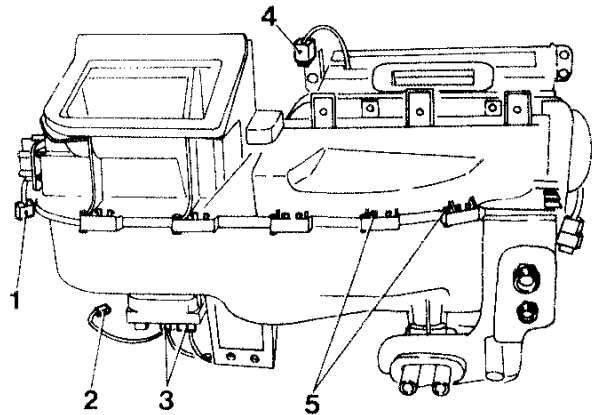
To refit, reverse the procedure followed for removal.

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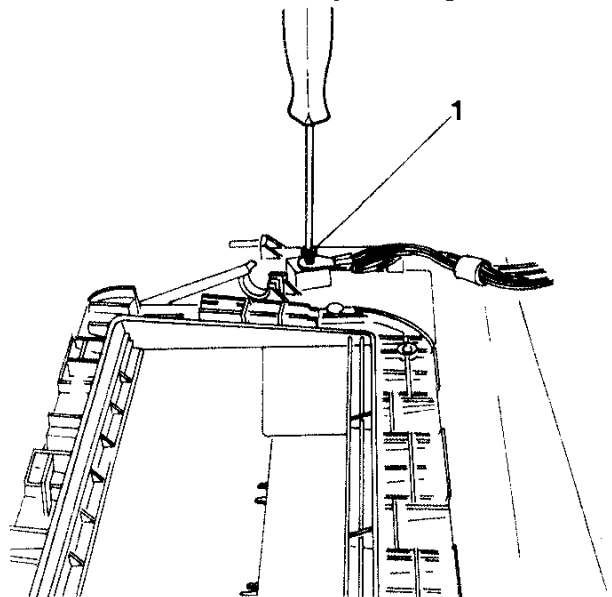
AIR MIXING VENT

Removal

- First carry out the removal procedure given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
1. Disconnect the connector from the electronic actuator controlling the external and recirculation air-flow regulation vent.
 2. Disconnect the connector from the electric fan.
 3. Detach the two connectors from the electronic fan-speed variator.
 4. Disconnect the connector from the upper mixed air temperature sensor.
 5. Loosen the screws securing the upper part of the conveyor (9 on the side and 3 on the front) and remove it using a thin-bladed screwdriver as a lever to disengage the tabs.



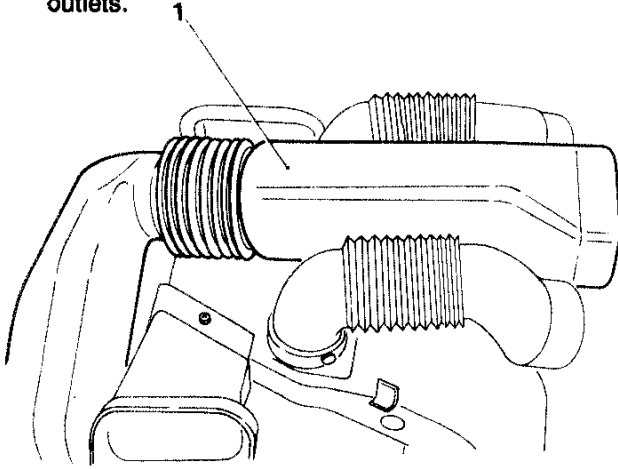
1. Loosen the screw securing the wiring.



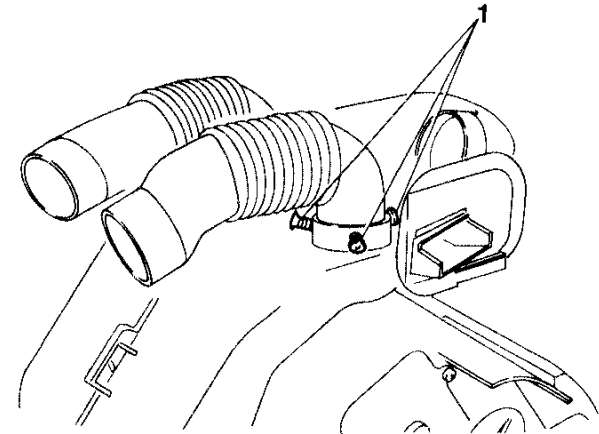
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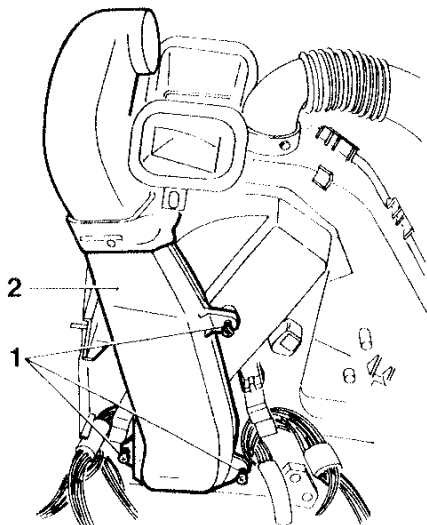
1. Disconnect the central tube carrying air to the tunnel outlets.



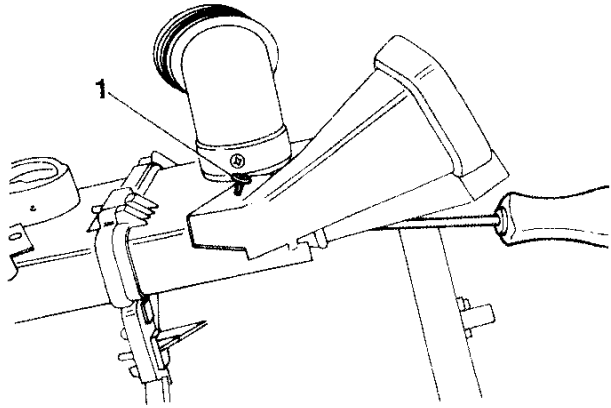
1. Loosen the screws securing the side outlets (three for each outlet).



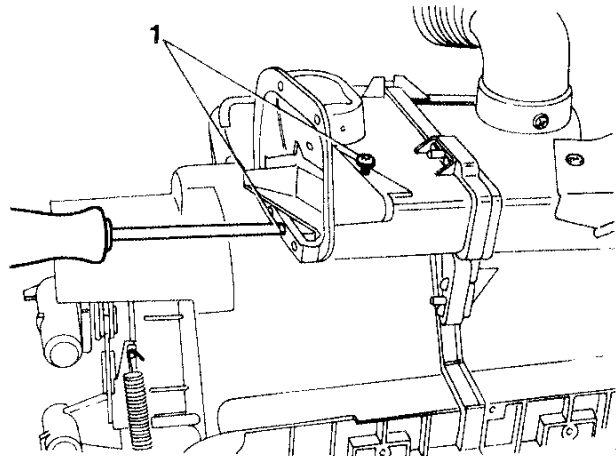
1. Loosen the three screws securing the upper part of the tube delivering air to the tunnel outlets.
2. Remove the tube.



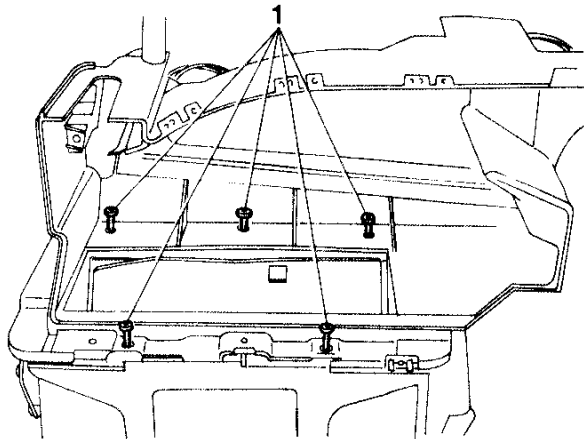
1. Loosen the two screws and remove the right-hand side outlet.



1. Loosen the two screws and remove the left-hand side outlet.

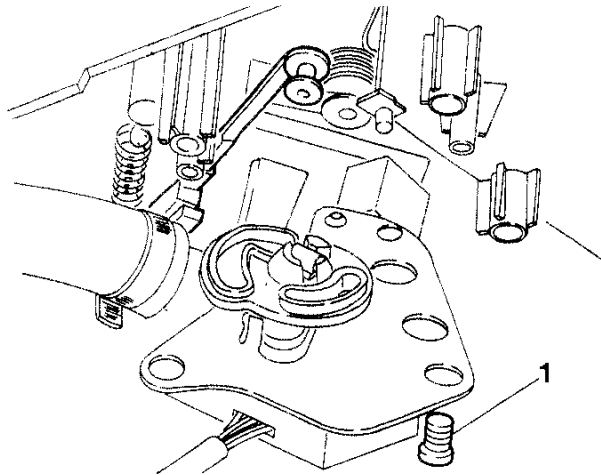


1. Loosen the five screws securing the lower part of the conveyor to the heating-distribution unit and remove the unit.

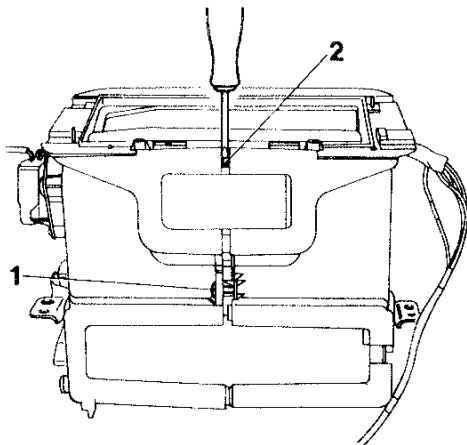




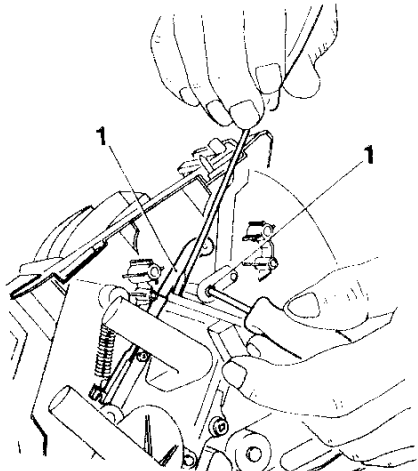
1. Loosen the screws securing the actuator to the air mixing vent and remove the vent.



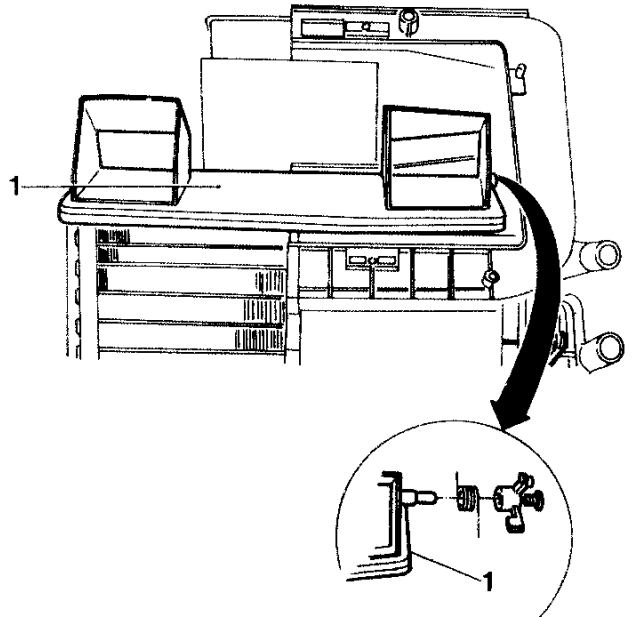
1. Loosen the screws securing the two casing halves of the heating-distribution unit.
2. Using a screwdriver as a lever separate the two casing halves.



1. Loosen the screw and remove the air mixing vent control lever.



1. Remove the air mixing vent and relative springs.



Refitting



To refit, reverse the procedure followed for removal.

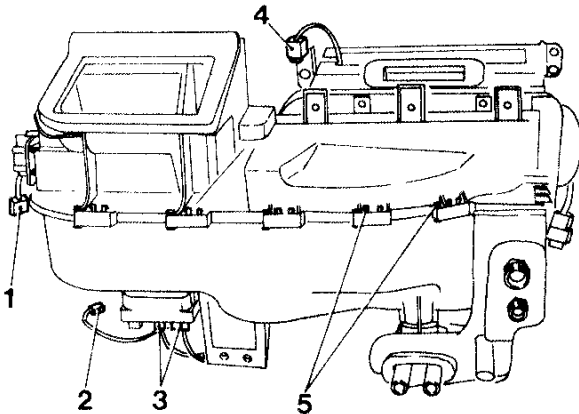


UPPER AIR DISTRIBUTION VENT

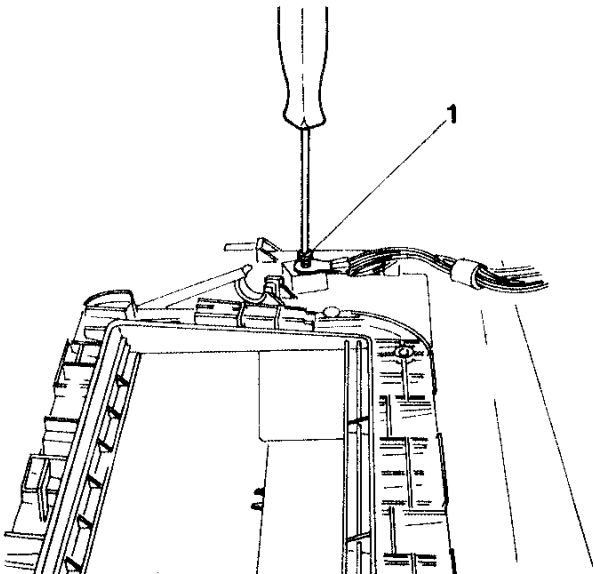
Removal

— First carry out the removal procedure given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".

1. Disconnect the connector from the electric motor controlling the external and recirculation air flow regulation vent.
2. Disconnect the connector from the electric fan.
3. Disconnect the two connectors from the electronic fan-speed variator.
4. Disconnect the connector from the upper mixed air temperature sensor.
5. Loosen the screws securing the upper part of the conveyor (9 on the side and 3 on the front) and remove it using a thin-bladed screwdriver as a lever to disengage the tabs.

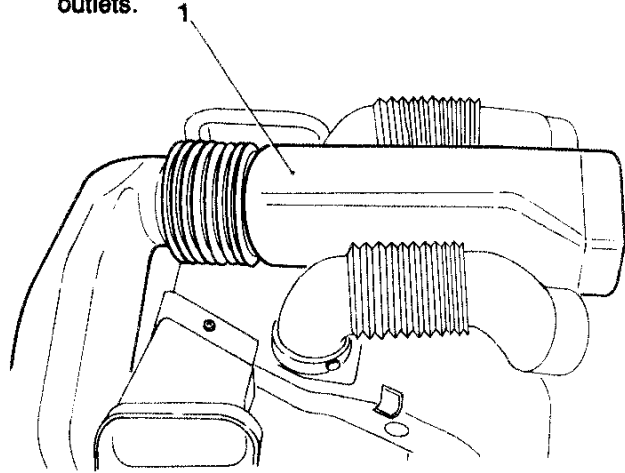


1. Loosen the screw securing the wiring.

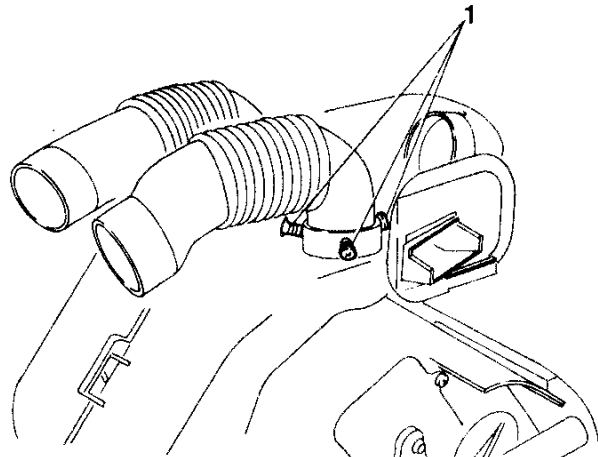


PA4655D100000

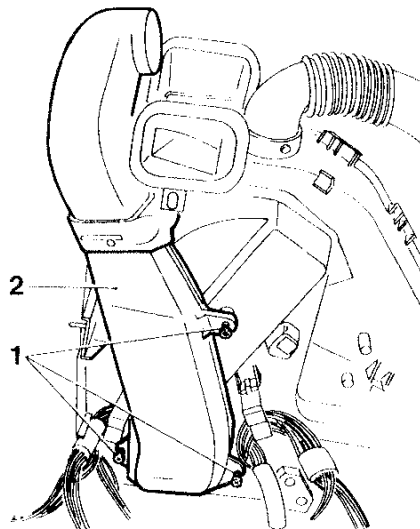
1. Disconnect the central tube carrying air to the tunnel outlets.



1. Loosen the screws securing the side outlets (three for each outlet).



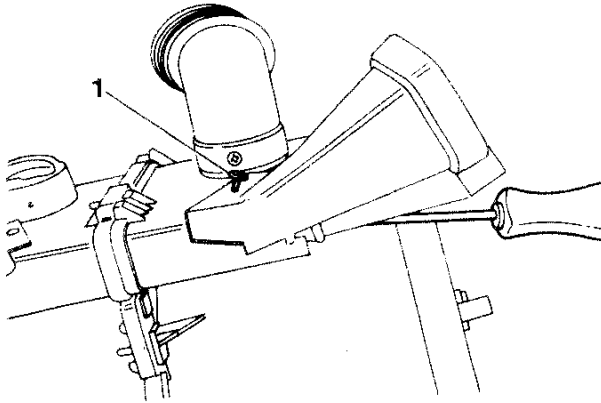
1. Loosen the three screws securing upper part of the tube carrying air to the tunnel outlets.
2. Remove the tube.



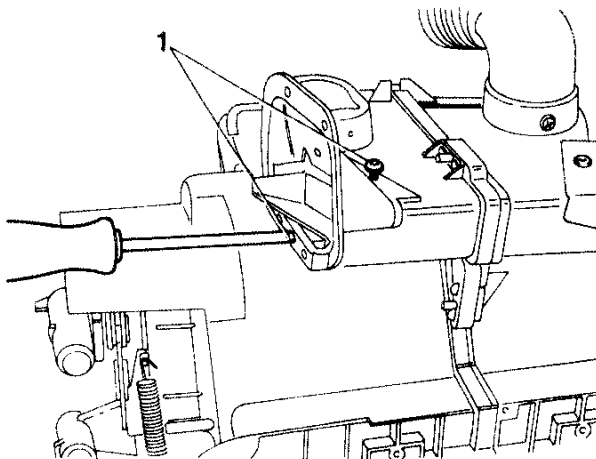
07 - 1991



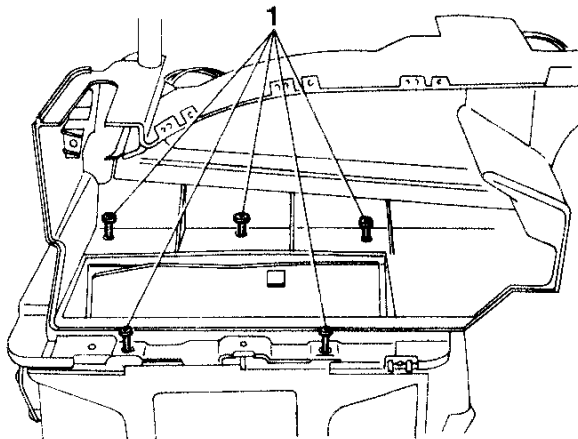
1. Loosen the two screws and remove the right-hand side outlet.



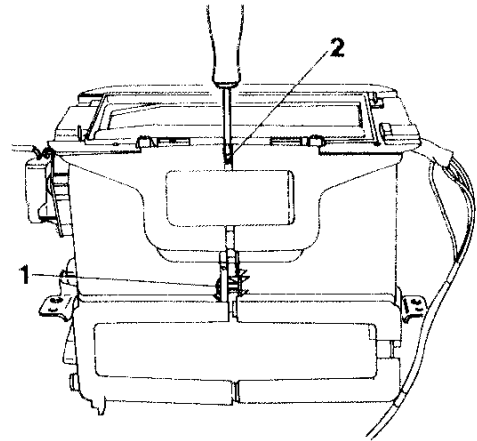
1. Loosen the two screws and remove the left-hand side outlet.



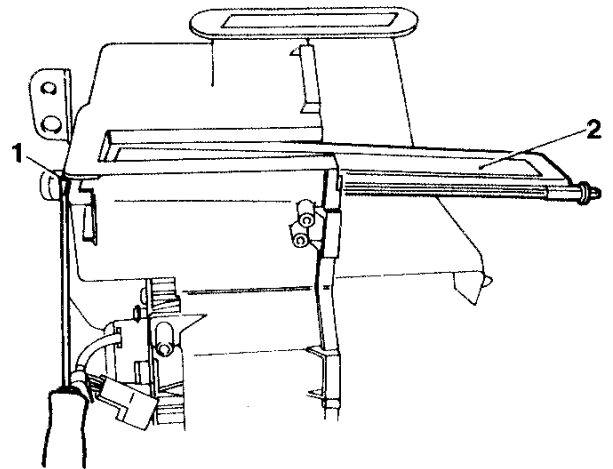
1. Loosen the five screws securing the lower part of the conveyor to the heating-distribution unit and remove the unit.



1. Loosen the screws securing the two heating-distribution unit casing halves.
2. Using a screwdriver as a lever, separate the two casing halves.



1. Using a screwdriver as a lever release the upper air distribution vent from the actuator levers.
2. Remove the upper air distribution vent.



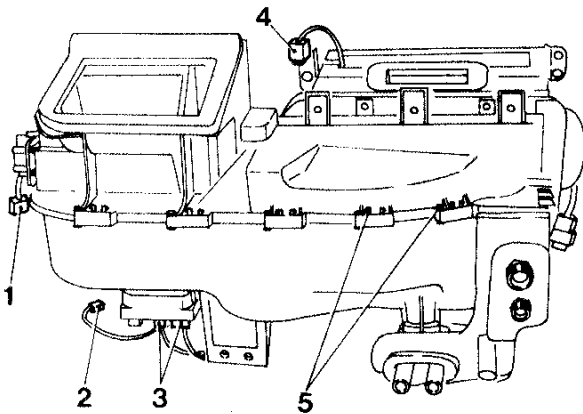
Refitting



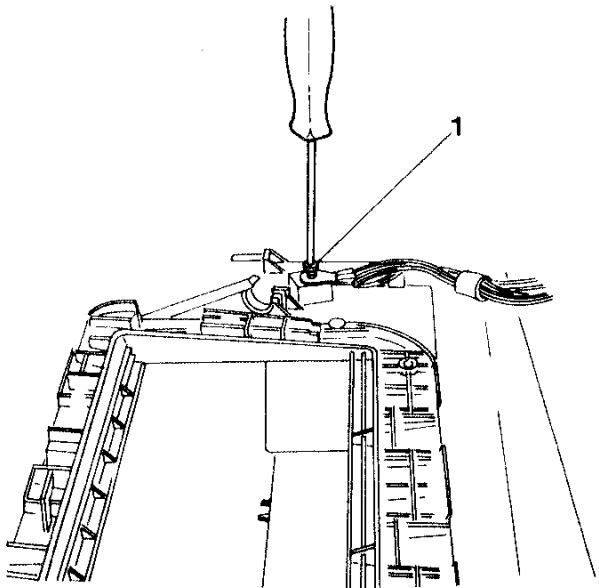
To refit, reverse the procedure followed for removal.

**LOWER AIR DISTRIBUTION VENT****Removal**

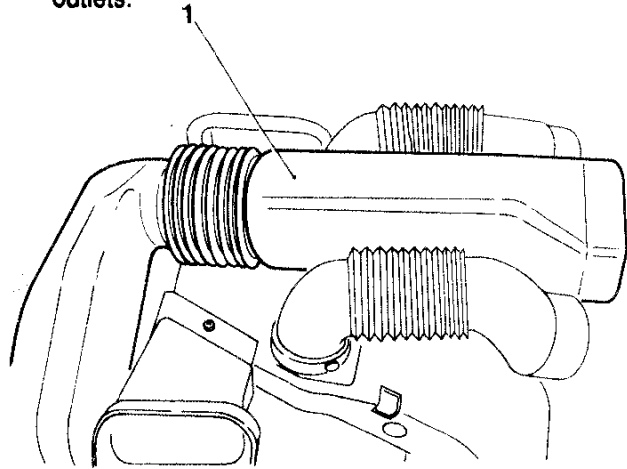
- First carry out the removal procedure given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
1. Disconnect the connector from the electric motor controlling the external and recirculation air flow regulation vent.
 2. Disconnect the connector from the electric fan.
 3. Disconnect the two connectors from the electronic fan-speed variator.
 4. Disconnect the connector from the upper mixed air temperature sensor.
 5. Loosen the screws (9 on the side and 3 on the front) securing the upper part of the conveyor and remove it using a thin-bladed screwdriver as a lever to disengage the tabs.



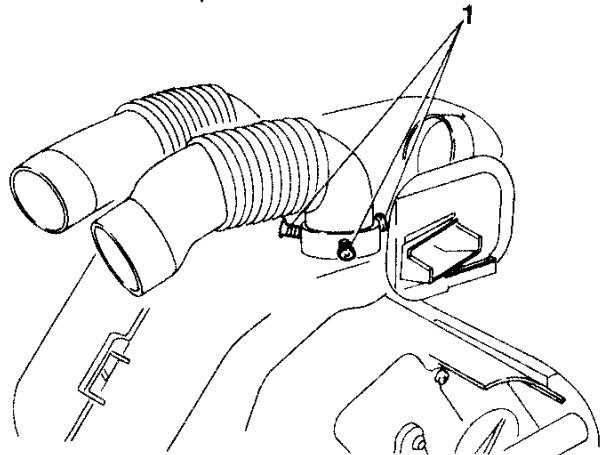
1. Loosen the screw securing the wiring.



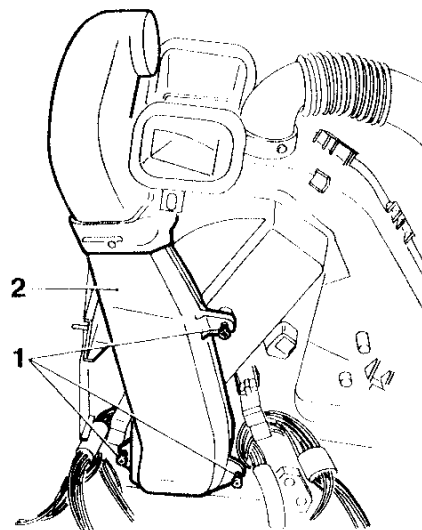
1. Disconnect the central tube carrying air to the tunnel outlets.



1. Loosen the screws securing the side outlets (three for each outlet).

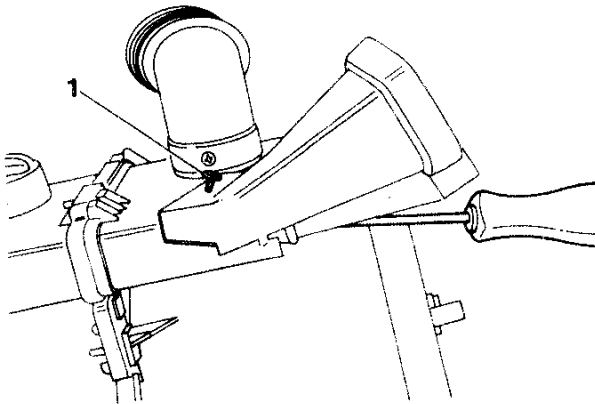


1. Loosen the three screws securing upper part of the tube carrying air to the tunnel outlets.
2. Remove the tube.

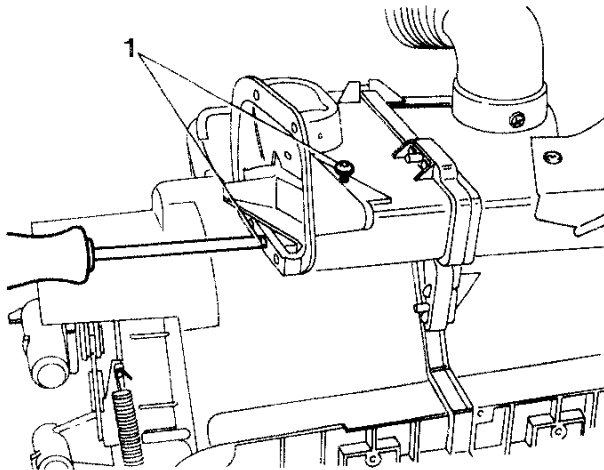




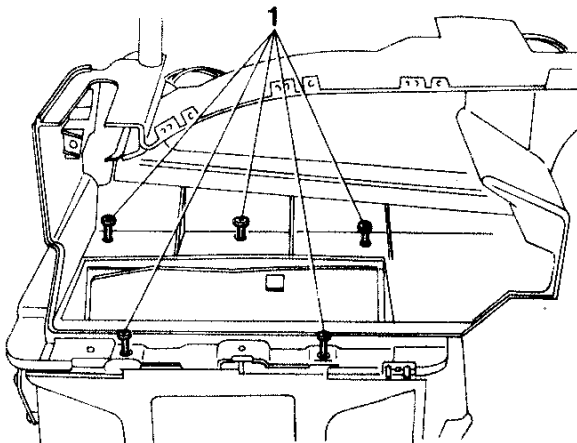
1. Loosen the two screws and remove the right-hand side outlet.



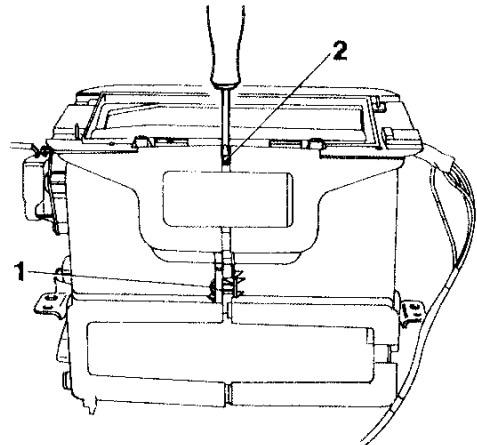
1. Loosen the two screws and remove the left-hand side outlet.



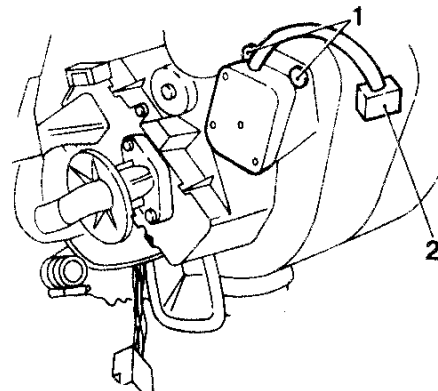
1. Loosen the five screws securing the lower part of the conveyor to the heating-distribution unit and remove the unit.



1. Loosen the screws securing the two heating-distribution unit casing halves.
2. Using a screwdriver as a lever separate the two casing halves.

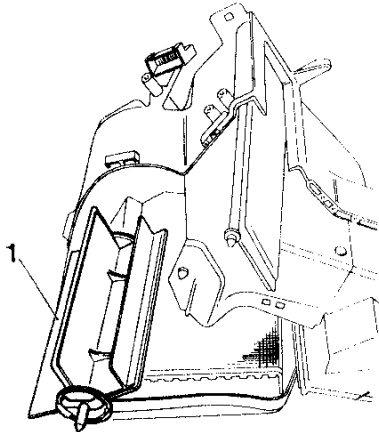


1. Unscrew the screws securing the plate and actuator to the left-hand side wall of the heating-distribution unit.
2. Remove the actuator.





1. Remove the lower air distribution vent.



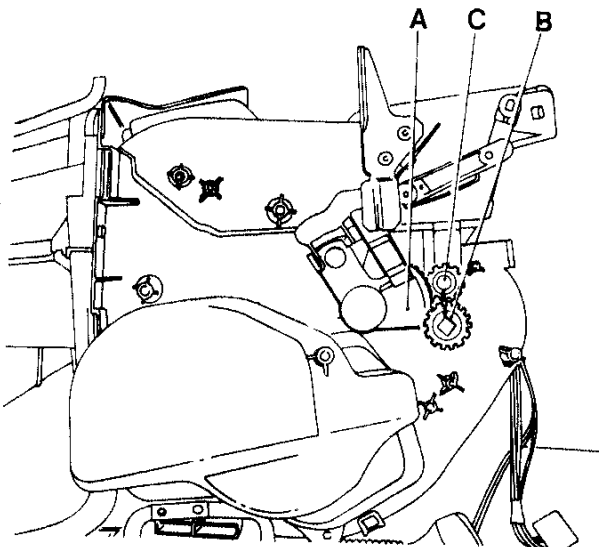
Refitting



To refit, reverse the procedure followed for removal.

Supplementary Indications for refitting

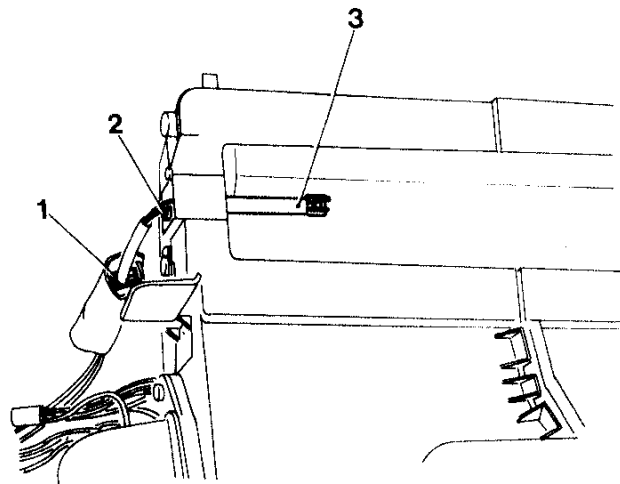
- The gear (B), which forms a single unit with the lower air distribution vent, is orientated by the relative electric motor and orientates the toothed section (A) by means of an intermediate gear (C).
- When refitting the heating-distribution unit, the white raised part of the toothed section must be aligned with that of the intermediate gear and the second raised part of the intermediate gear must be aligned with that of the gear forming part of the lower air distribution vent.



UPPER MIXED AIR TEMPERATURE SENSOR

Removal

- First carry out the removal procedure given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
1. Disconnect the electrical connector.
 2. Loosen the screw securing the heating-distribution unit.
 3. Remove the sensor.



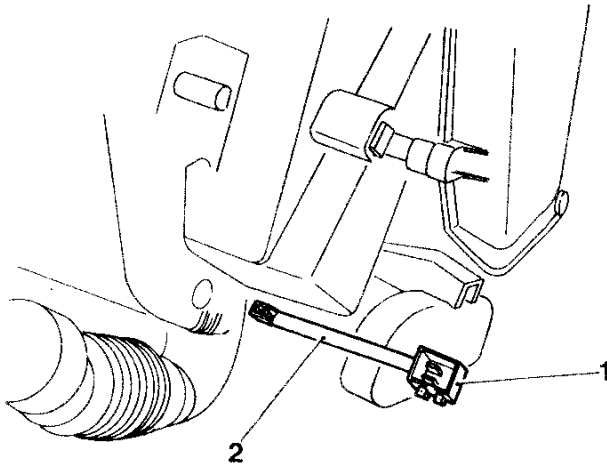
Refitting



To refit, reverse the procedure followed for removal.

**LOWER MIXED AIR TEMPERATURE SENSOR****Removal**

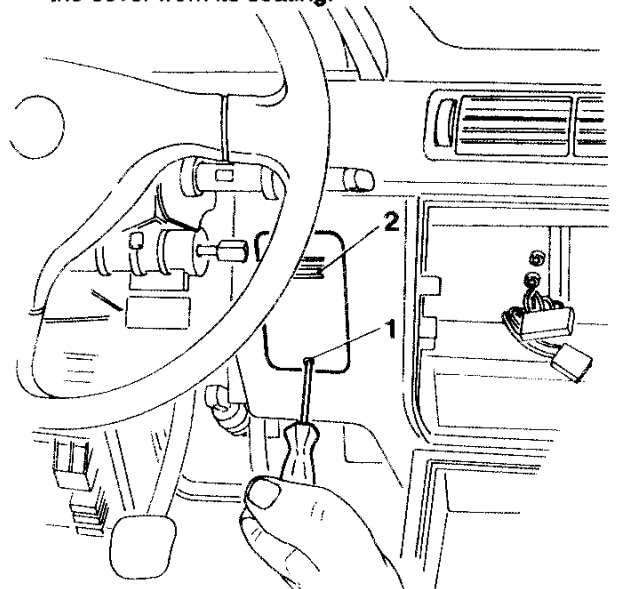
- Detach the dashboard skirting (see GROUP 66).
- 1. Disconnect the electrical connector.
- 2. Using a thin-bladed screwdriver as a lever, remove the sensor.

**Refitting**

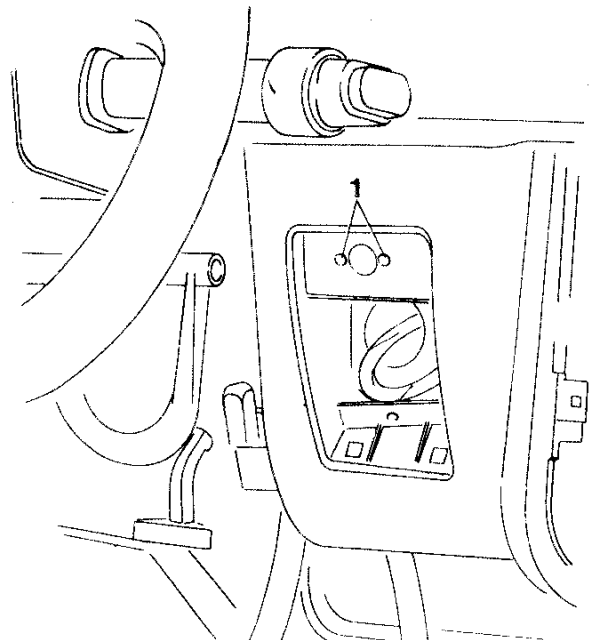
To refit, reverse the procedure followed for removal.

PASSENGER COMPARTMENT AIR TEMPERATURE SENSOR**Removal**

1. Loosen the lower screw on the passenger compartment air temperature sensor cover.
2. Using a thin-bladed screwdriver as a lever remove the cover from its seating.

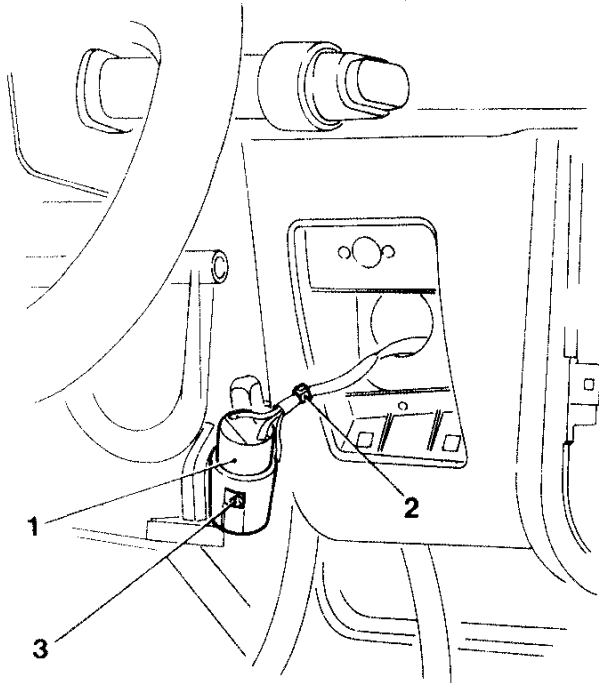


1. Loosen the screw securing the sensor.





1. Withdraw the sensor from the inside.
2. Disconnect the connecting cables.
3. Remove the sensor.

**EXTERNAL AIR TEMPERATURE SENSOR**

- This sensor forms part of the left-hand door mirror. If the sensor is faulty it is necessary to replace the entire group (see GROUP 40).

Refitting

To refit, reverse the procedure followed for removal.



AUTOMATIC HEATING-VENTILATION SYSTEM WITH CONDITIONER

DESCRIPTION OF SYSTEM

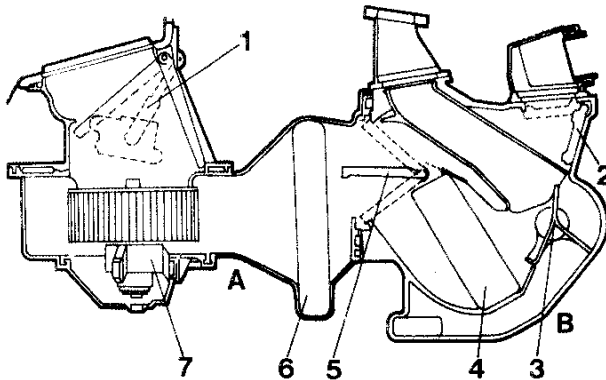
The heating-ventilation system enables the desired conditions in the passenger compartment to be reached in the shortest possible time and maintains them whatever the speed of the vehicle or outside conditions.

The system can be divided into three parts:

- an assembly including the air conveyor and heating-distribution unit;
- a closed circuit generating cold (conditioner);
- an electronic control unit.

Conveyor and heating-distribution unit assembly

The assembly including the conveyor (A) and the heating-distribution unit (B) is shown in cross-section in the figure below.



1. External/recirculated air vent
2. Upper air distribution vent
3. Lower air distribution vent
4. Heating/cooling radiator
5. Air mixing vent
6. Evaporator
7. Electric fan

The conveyor (A) can in turn be divided into two parts, one upper and one lower. One end of the upper part is shaped so that it is connected with the lower right-hand side of the passenger compartment external compartment under the windscreen.

In the upper front part, in line with the external air intake there is a second opening in communication with the passenger compartment (air intake for the recirculation function).

Between the two air intake openings, inside the conveyor a motorized vent has been fitted (1) which, when correctly orientated, can shut off one of the two openings. The vent is controlled by two levers and an electric actuator (motor) fixed to the outside of the conveyor.

Inside the conveyor opposite the air intake, an evaporator (6) has been fitted and it is this which performs the cooling function. A multiple-speed electric fan (7) is installed on the lower part near the air intake.

On the left-hand side of the heating-distribution unit another two electric actuators are fitted which, by levers, rods and a toothed section move the lower (3) and upper (2) air distribution vents and air mixing vent (5) to the correct angle. They also control the position of the tap installed on the inlet duct of the heating/cooling radiator (4).

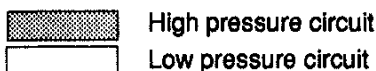
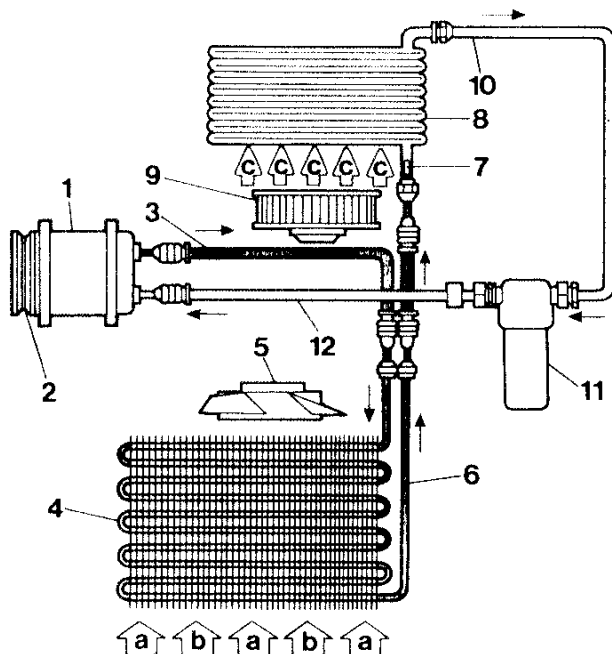
**Conditioner**

The circuit is shown diagrammatically in the figure below and is mainly composed of the following parts:

- a compressor installed on the engine which sucks the cooling liquid (FREON 12) from the evaporator outlet;
- a condenser installed on the front of the engine cooling radiator (high pressure circuit);
- an evaporator located on the conveyor assembly;
- an accumulator-dehydrator.

The parts given above are interconnected by suitable hoses. On the hose connecting the condenser to the evaporator a three-level pressure switch has been fitted and is the only part of the system with control and safety functions.

Also inside this hose an expansion valve has been inserted and on the hose connecting the accumulator-dehydrator a one-level pressure switch has been fitted which acts as a defroster.



- a. Flow of air to cool condenser originating from the front grill when the vehicle is moving.
 - b. Flow of air to cool condenser generated by its electric fan (5) when the vehicle is stationary or travelling slowly.
 - c. Flow of air for the evaporator generated by its electric fan located on the heating-distribution unit.
1. Compressor
 2. Pulley with electromagnetic coupling
 3. Hose between compressor and condenser
 4. Condenser
 5. Electric fan for condenser
 6. Hose between condenser and evaporator
 7. Expansion valve
 8. Evaporator
 9. Electric fan for evaporator
 10. Hose between evaporator and accumulator-dehydrator
 11. Accumulator-dehydrator
 12. Hose between accumulator and compressor

The conditioner assembly cools and dehumidifies the air before it reaches the passenger compartment. It operates according to a common refrigeration cycle travelled by liquid FREON 12 (R12) where it changes state (from liquid to gas and vice-versa) absorbing and radiating a large quantity of heat.

During operation, two pressure levels are created which are maintained on one side by the compressor and on the opposite side by the expansion valve on the evaporator inlet.

Two needle valves are fitted on the hoses in order to discharge/charge the system.

The refrigerating fluid leaves the compressor as a gas at high temperature and high pressure. It then enters the condenser, is cooled and comes out as a liquid. It then passes via the dehydrator which absorbs any particles of water which if allowed to continue around the circuit would, if frozen, block the expansion valve thereby reducing or cancelling the efficiency of the cycle.



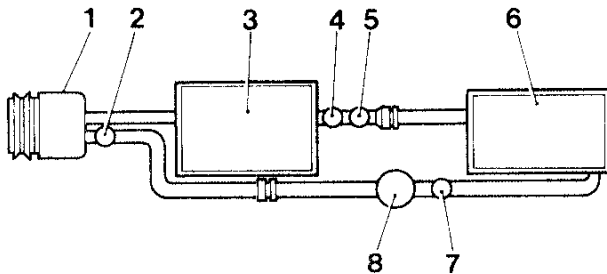
The expansion valve located on the inlet to the evaporator, atomizes the fluid and lowers the pressure which results in a decrease in temperature.

The fluid which is still in a liquid state enters the evaporator where it is vapourized, absorbing heat from the air directed onto the blades of the fan.

The air in contact with the cold walls of the evaporator loses a high percentage of its humidity which, when condensed is discharged outside the vehicle through a special drainage tube.

The fluid in a gaseous state leaves the evaporator and is once again sucked in by the compressor and the cycle is repeated.

A three-level pressure switch (4) is inserted in the high pressure refrigerating circuit near the dehydrator and controls the engagement and disengagement of the compressor. A one-level defroster pressure switch (7) installed at the evaporator forms another permit for the supply to the compressor.

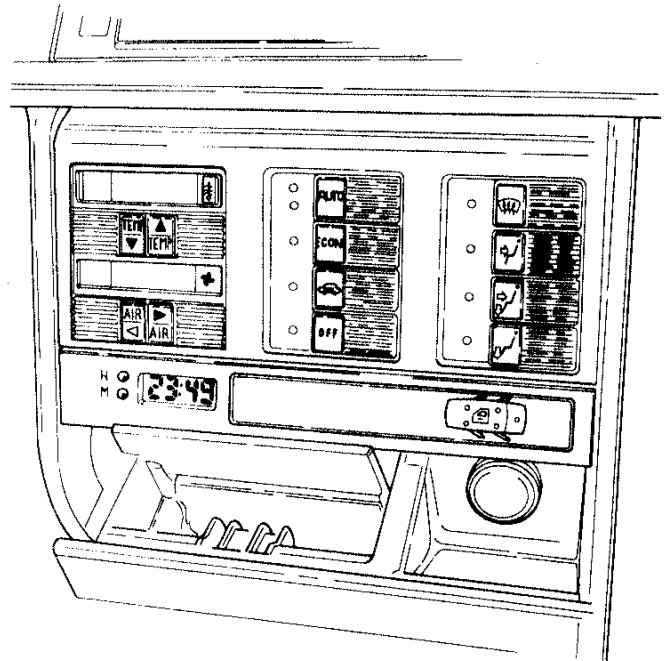


1. Compressor
2. Needle valve for charging/discharging the system
3. Condenser
4. Three-level pressure switch
5. Needle valve for charging/discharging the system
6. Evaporator
7. One-level pressure switch (defroster)
8. Accumulator-dehydrator

Electronic control unit

The system's automatic operation is controlled by an electronic unit located on the central console (see figure below).

On the front part of the unit there is a panel equipped with 13 buttons and two displays (see "ELECTONIC CONTROL UNIT - FRONT PANEL").

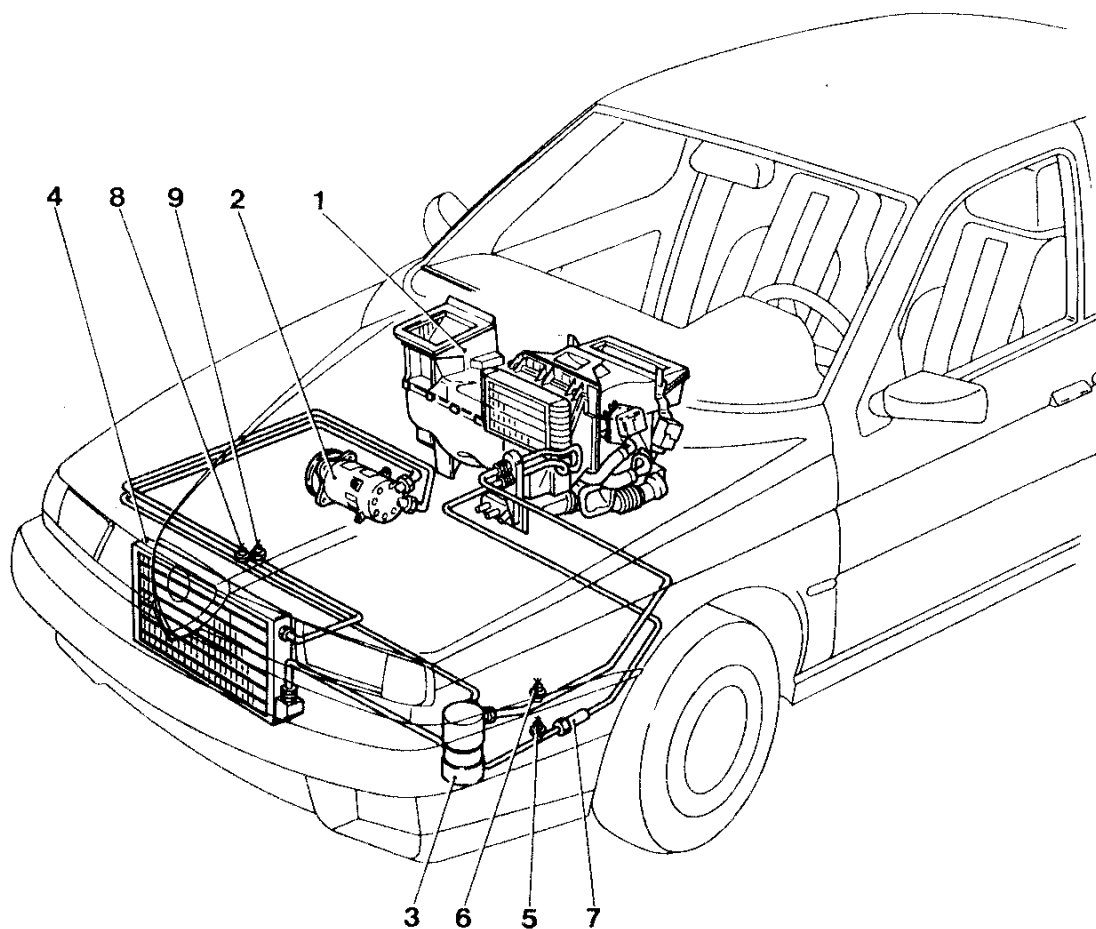




IDENTIFICATION AND POSITION OF THE MAIN COMPONENTS OF THE CONDITIONING SYSTEM ON THE VEHICLE

Most of the equipment forming the system is included in the heating-ventilation unit located between the engine compartment and the passenger compartment under the dashboard.

Only the compressor, condenser, accumulator-dehydrator, the pressure switches and the expansion valve are installed in the engine compartment.



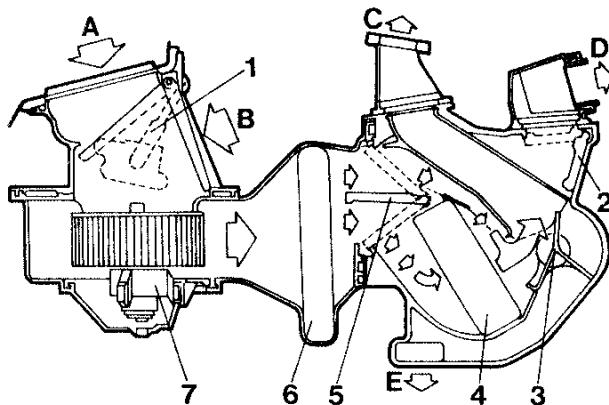
1. Heating-ventilation assembly
2. Compressor
3. Accumulator-dehydrator
4. Condenser
5. Three-level pressure switch
6. One-level pressure switch

7. Expansion valve
8. Needle valve for charging/recharging Freon in the low pressure hose
9. Needle valve for charging/recharging Freon in the high pressure hose



AIR-FLOW IN THE CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT

The flow of external air (A), see figure below, is conveyed to the heating-distribution unit via the motorized regulation vent (1), the electric fan (7) and the evaporator (6) where, if the conditioner is on, it is cooled and dehumidified. If the recirculation function is activated the air comes directly from the passenger compartment (B).



- A. Flow of external air
- B. Flow of recirculated air
- C. Flow of air leaving the windscreen diffusers
- D. Flow of air leaving the front, central and side outlets
- E. Flow of air leaving the floor diffusers at the front and rear of the vehicle
- 1. Vent adjusting the flow of external and recirculated air
- 2. Upper air distribution vent
- 3. Lower air distribution vent
- 4. Heating/cooling radiator
- 5. Air mixing vent
- 6. Evaporator
- 7. Electric fan

Depending on the position of the motorized air mixing vent (5) the flow of air coming from the evaporator (6) is either entirely directed to the motorized air distribution vents (2 and 3) or partially or totally passes the heating/cooling radiator (4) to pass on to the distribution vents (2 and 3).

Depending on the position of the upper (2) and lower (3) air distribution vents the flow of air is conveyed to the various outlets and diffusors (see relative paragraph).

The electric fan is used to convey recirculation air under two conditions:

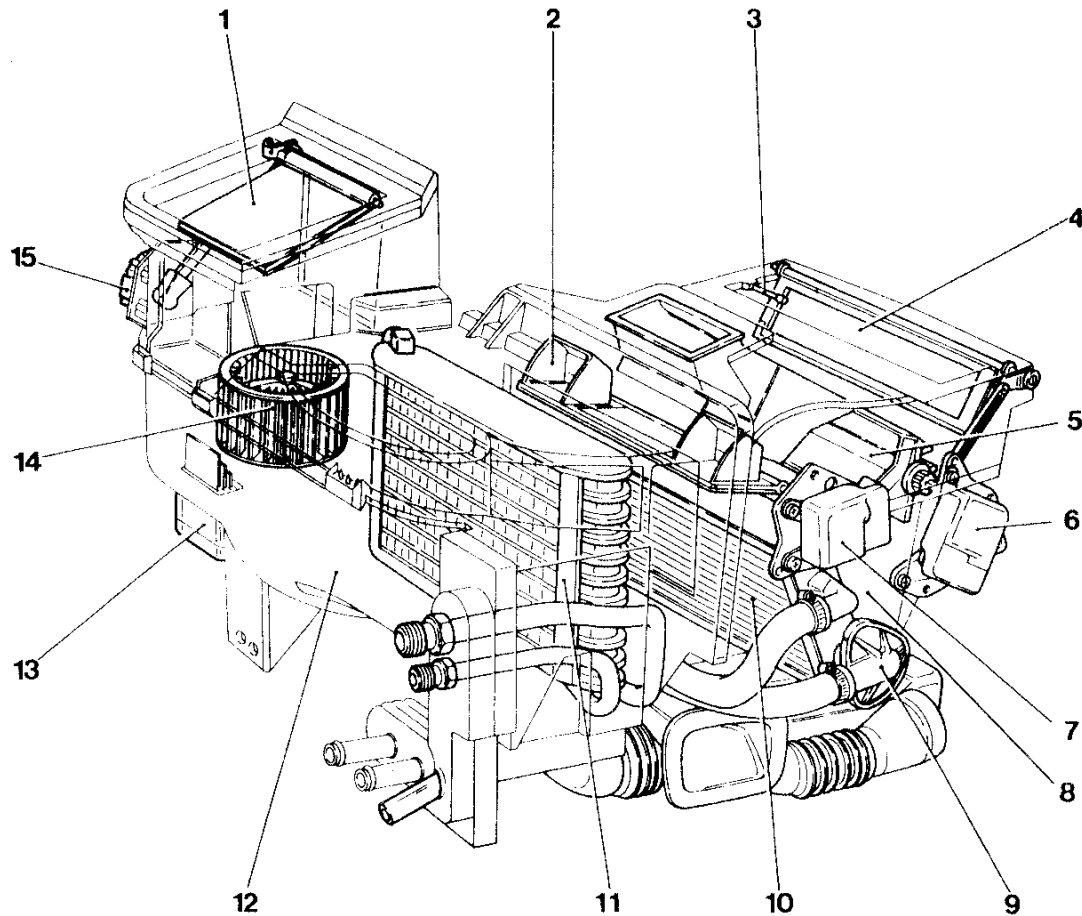
- when the environment outside the vehicle is polluted (queues, tunnels etc);
- when it is necessary to lower the temperature in the passenger compartment in a short time (extended parking in direct sunlight during the summer months).

In the second case proceed as follows:

- lower the side windows and keep them down for the first hundred yards or so in order to eliminate the hot air from the passenger compartment;
- raise the windows and engage the conditioner (setting the code LO on the display and pressing the AUTO button).

If the recirculated air function is not automatically activated, press the button depicting a vehicle.

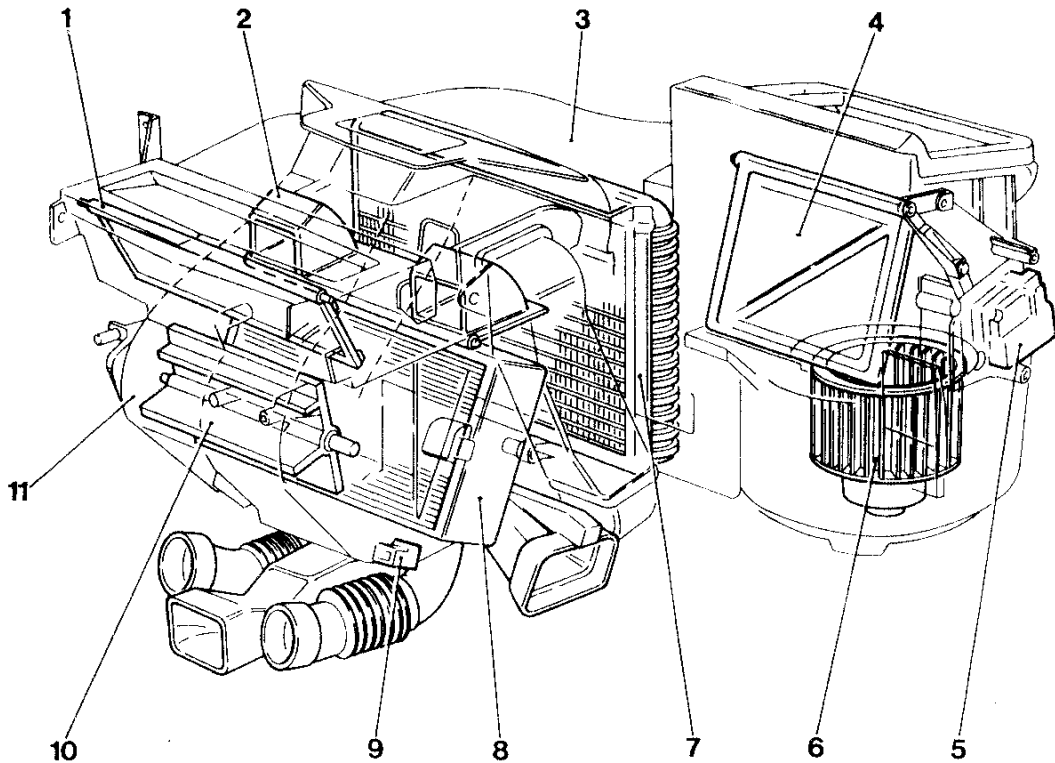
The recirculated air which becomes increasingly cooler passes through the evaporator and is cooled even further. When the passenger compartment reaches an optimal temperature (if not already deactivated), interrupt the passage of the recirculated air through the evaporator and reactivate the external air function to change the air by pressing the button mentioned above.

**IDENTIFICATION AND POSITION OF THE COMPONENTS OF THE CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT (VIEW FROM ENGINE COMPARTMENT SIDE)**

- | | |
|--|---|
| 1. External and recirculated air regulation vent | 9. Tap regulating entry of engine coolant in heating/cooling radiator |
| 2. Air mixing vent | 10. Heating/cooling radiator |
| 3. Upper mixed air temperature sensor | 11. Evaporator |
| 4. Upper air distribution vent | 12. Conveyor |
| 5. Lower air distribution vent | 13. Electric fan speed electronic variator with built-in temperature sensor |
| 6. Upper and lower air distribution vent control electronic actuator | 14. Electric fan |
| 7. Tap and air mixing vent control electric actuator | 15. Recirculated and external air regulation vent control electronic actuator |
| 8. Heating-distribution unit | |



IDENTIFICATION AND POSITION OF THE COMPONENTS OF THE CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT (VIEW FROM PASSENGER COMPARTMENT SIDE)



1. Upper air distribution vent
2. Air mixing vent
3. Conveyor
4. External and recirculated air regulation vent
5. External and recirculated air regulation control electric actuator

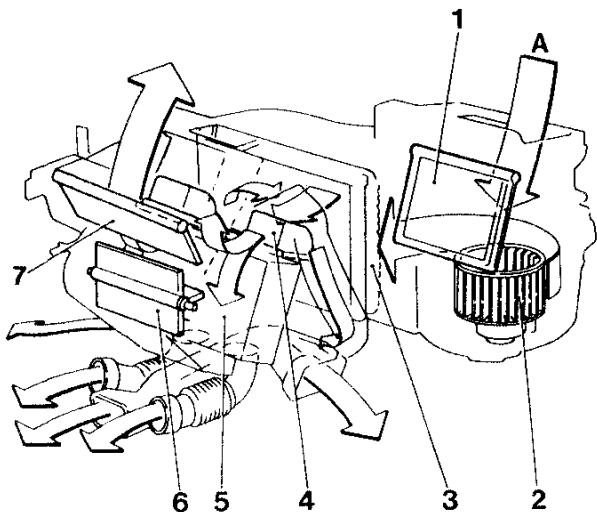
6. Electric fan
7. Evaporator
8. Heating/cooling radiator
9. Lower mixed air temperature sensor
10. Lower air distribution vent
11. Heating-distribution unit



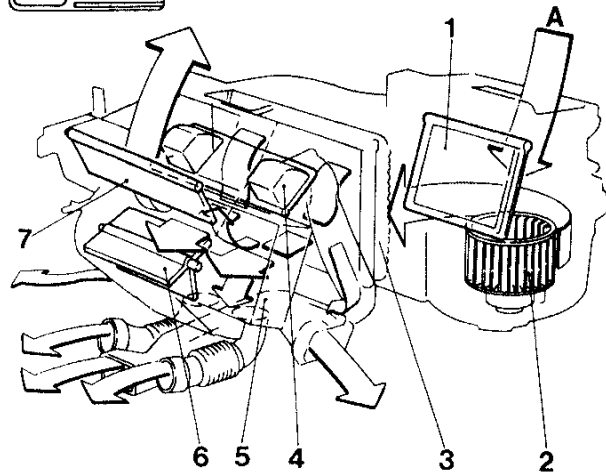
DIAGRAMS OF THE MECHANICAL AIR FLOW DISTRIBUTION IN THE CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT

In the following diagrams the recirculation and external air flow regulation vent (1) is shown in the position for entry of external air (A).

Maximum cold: the flow of external air (A) passes the electric fan (2), the evaporator (3) and, finding the air mixing vent (4) in the position which excludes the heating/cooling radiator (5), by-passes it and passes through the lower (6) and upper (7) air distribution vents where, depending on the buttons activated on the right hand column of the control panel, it is conveyed to the various outlets and diffusers in the passenger compartment.

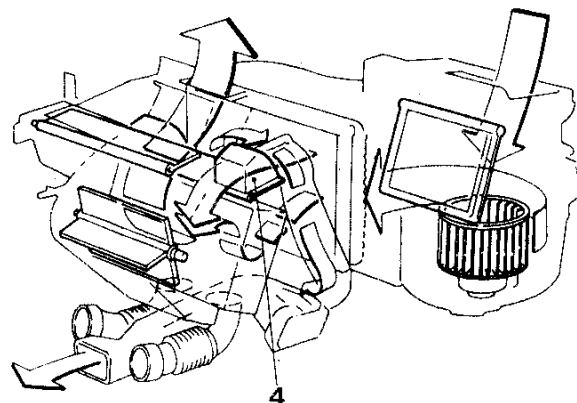


Maximum heat: The flow of external air (A) passes the electric fan (2), the evaporator (3) and reaches the air mixing vent (4) which conveys it to the heating/cooling radiator (5) from where it passes to the upper (7) and lower (6) air distribution vents where, depending on the buttons activated on the right-hand column of the control panel, it is conveyed to the various outlets and diffusers in the passenger compartment.



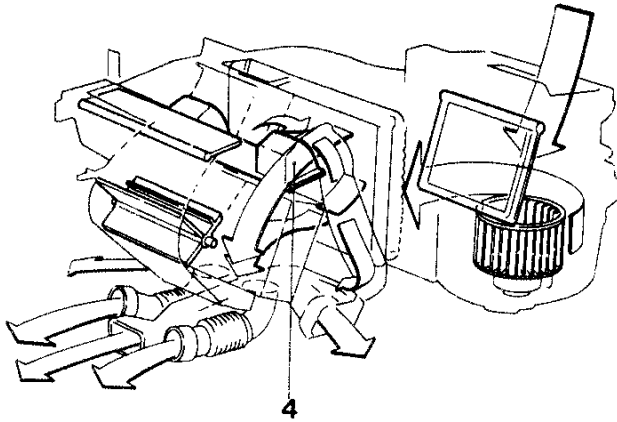
Air distribution on the basis of the buttons of the third column on the control panel

In the following diagrams the air mixing vent (4) is shown in a position between maximum heat and maximum cold (mixed air condition).

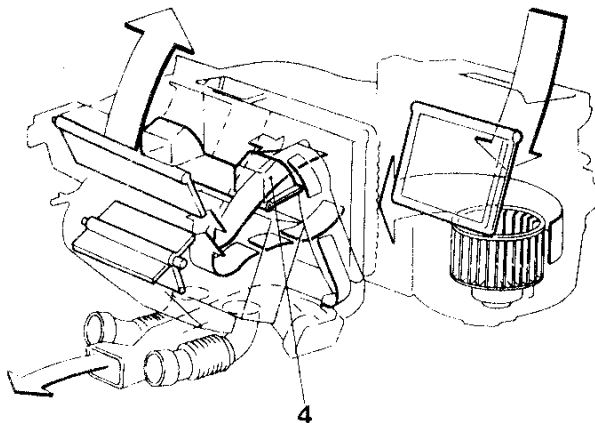




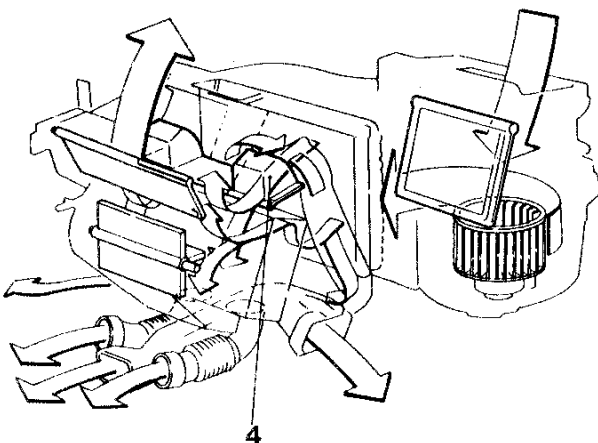
All to floor



All to front



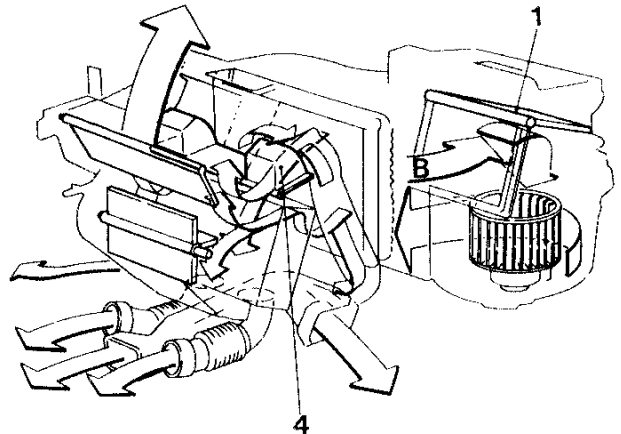
Half to front, half to floor



In the diagram below the air mixing vent (4) is still shown in the mixed air position and the recirculation vent (1) in the position which totally excludes external air (entry of recirculated air (B)).



Recirculation



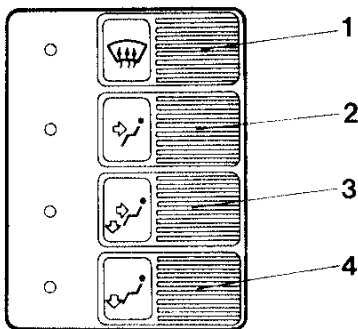


AIR-FLOW DISTRIBUTION IN THE PASSENGER COMPARTMENT

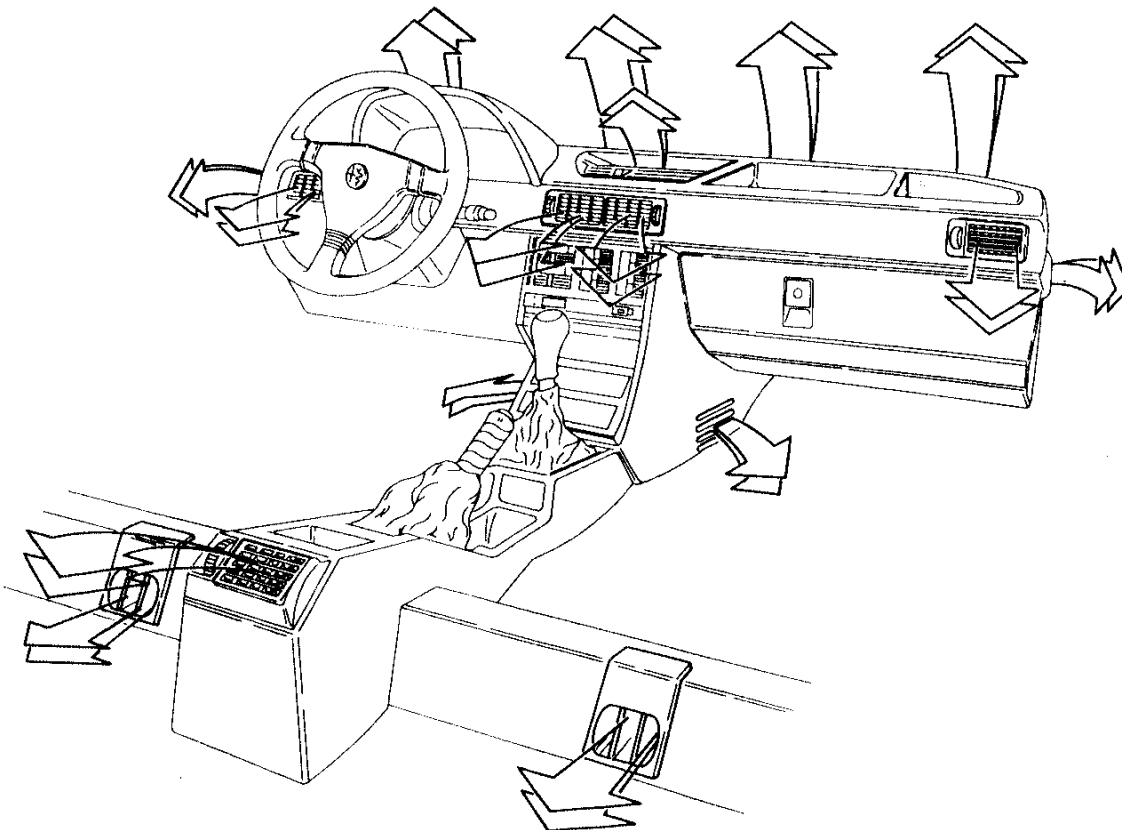
The ideograms identifying the right-hand buttons on the control panel show diagrammatically in which direction the flow of external or recirculated air will leave the various outlets and diffusers in the passenger compartment.

Each button is fitted with a luminous led which comes on to signal that that particular button has been activated.

1. Button selecting air distribution to the upper outlets and diffusers.
2. Button selecting air distribution to the front outlets and diffusers.
3. Button selecting air distribution to the front and lower outlets and diffusers.
4. Button selecting air distribution to the lower outlets and diffusers.



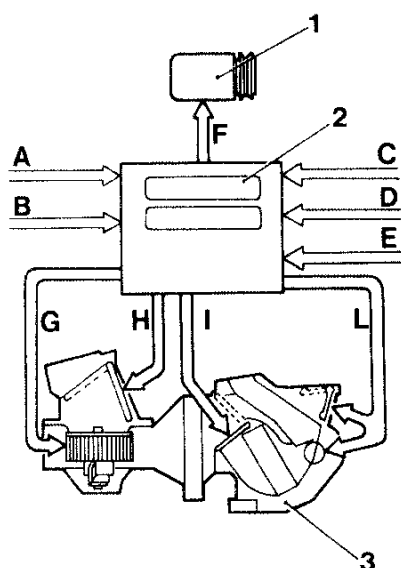
PASSENGER COMPARTMENT AIR OUTLETS AND DIFFUSORS





DESCRIPTION OF THE OPERATION OF THE SYSTEM'S ELECTRONIC CONTROL UNIT

The operation of the system is controlled by a control unit which, on the basis of the information transmitted to it and the manually selected temperature value, controls the speed of the electric fan via the electronic variator and the positioning of the vents which direct the flow of air.



- A. External air temperature
- B. Passenger compartment air temperature
- C. Mixed air temperature at the lower air distribution vent
- D. Mixed air temperature at the upper air distribution vent
- E. Speedometer signal
- F. To the compressor
- G. To the electric fan speed control electronic variator
- H. To the air intake vent
- I. To the air mixing vent
- L. To the upper and lower distribution vents
- 1. Compressor
- 2. Electronic control unit
- 3. Conveyor assembly and heating-distribution unit

The four temperature values are communicated to the control unit by four sensors:

- outside air temperature sensor of the NTC type which protrudes from the lower surface of the left-hand door mirror;
- Self ventilating passenger compartment air temperature sensor, of the NTC type, located in the inner part of the instrument panel under the control panel on the right-hand side of the steering wheel;
- two mixed air temperature sensors of the NTC type. One sensor is located in the upper part and one in the lower part of the heating-distribution unit on the right-hand side.

The microprocessor which controls the system is also equipped with an emergency program which is activated if a fault develops in one of the temperature sensors. In this event the logic of the microprocessor fixes the temperature values within the passenger compartment at a comfortable level.

The speedometer signal is communicated to the electronic control unit by the relative sensor which is installed on the gear lever.

Depending on the air temperature values and the speed of the vehicle communicated by the sensors and the desired temperature value of the air within the passenger compartment, the electronic control unit:

- activates or deactivates the electromagnetic coupling of the compressor pulley;
- supplies power to the electric motor which, by way of two levers, two rods and a disk acting as a cam, moves the mixing vent to the required position and, at the same time, moves the tap located on the inlet duct of the heater to the correct degree of opening;
- supplies power to the electric actuator which directly rotates the lower air distribution vent and, by way of a toothed section with two levers, moves the upper air distribution vent to the required position;
- operates the electric fan at the required speed.

The system can be activated whatever the environmental conditions outside the vehicle or differences in engine temperature.



To bring the temperature in the passenger compartment to the maximum degree of comfort in the shortest possible time the control unit, on the basis of measured values, the mixed air temperature and vehicle speed,

adopts the strategy listed in the table on the following page when the ignition key is rotated from the STOP position to the MAR position.

MEASURED VALUE**STORED VALUE TAKEN INTO CONSIDERATION**

1. Mixed air temperature below 40 °C
2. Mixed air temperature above 40 °C.
3. Vehicle speed below 30 Kph.
4. Vehicle speed above 30 Kph for at least one minute.

External air temperature is memorized.

The electronic control unit takes into consideration the outside air temperature memorized before the engine was switched off (key at STOP).

The outside air temperature is only updated if there is a decrease in relation to the value previously memorized when the ignition key was turned to the MAR position.

The outside air temperature value replaces the previously memorized value if there is an increase or decrease.

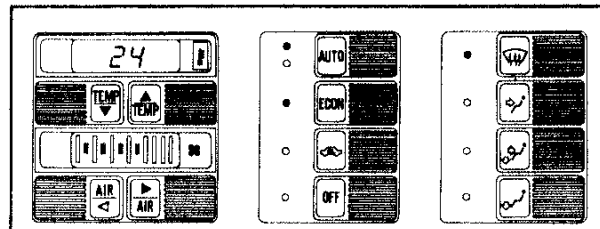
The second condition given in the table exists because, as the engine is still warm, the vehicle is considered to have been stationary only for a short while and that the environmental conditions are the same as those measured before the vehicle stopped.

The third condition given in the table exists to remedy the measurement of an artificial positive variation in the temperature of the outside air when the vehicle is in a queue or city traffic.

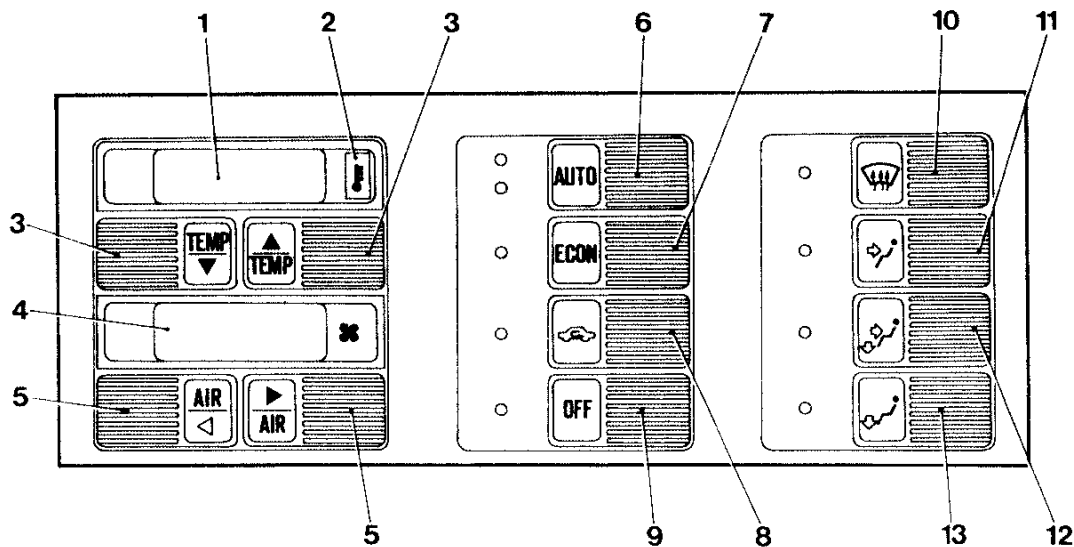
Each time the ignition key is turned from the MAR to the STOP position, the settings which were automatically or manually selected are memorized and will once again become operational when the ignition key is returned to the MAR position.

If the battery is disconnected for any reason and then reconnected after a certain period of time has elapsed, when the ignition key is rotated to the MAR position the indications given in the diagram on the right may appear on the control panel:

- temperature setting on the display 24 °C or 72 °F (depending on the model of electronic control unit);
- ECON button engaged (relative led on);
- illumination of the upper led next to the AUTO button; illumination of the leds regarding electric fan speed and automatically pre-selected air distribution.



FRONT PANEL OF ELECTRONIC CONTROL UNIT



1. Temperature display
2. External temperature display button
3. Buttons for setting temperature
4. Electric fan speed display
5. Buttons for setting fan speed
6. Automatic operation on/off button
7. Button for activation of econometer
8. Button for activation of passenger compartment air recirculation
9. Button to deactivate the system
10. Button for directing air flow to upper outlets and diffusers
11. Button for directing air flow to front outlets and diffusers
12. Button for directing air flow to the front and lower outlets and diffusers
13. Button for directing to the lower outlets and diffusers

By pressing button (9):

- the led relative to the button comes on;
- all the leds of the other buttons go out;
- the system is deactivated;
- the air distribution vents are locked in the last position selected;
- the air intake vents are rotated upwards in order to cut-off the flow of outside air.

Pressing any other button except button (2) actuates the function controlled by it and resets all the other operating conditions memorized by the electronic control unit before button (9) was pressed to deactivate the system. The system can also be reset by pressing button (9) a second time.

When the system is deactivated (button 9 on) it is possible to display the external air temperature by pressing button (2).

When the system is operating under the AUTO function (both leds on), by pressing button (7):

- the led relative to the button comes on;
- the lower led on button (6) goes out;
- the electromagnetic coupling of the compressor pulley is deactivated and cannot be reactivated;
- automatic control of the air intake vent is cut off, the vent is positioned vertically in order to exclude the recirculation of passenger compartment air (entry of external air).



The various functions given for button (7) are memorized and remain (even if the engine is switched off and then re-started) until button (7) is pressed again, handing back to the automatic control of the compressor and the position of the air intake vent.

By pressing button (6) all other manual settings are cancelled and then the system is automatically controlled on the basis of the measured temperatures and those set on the display.

The electronic control unit positions the various vents so that the maximum degree of comfort within the passenger compartment is reached in the shortest possible time.

Two leds next to button (6) come on to indicate the automatic operation of the system.

If one or more of the buttons are pressed (differing from those set automatically) to vary the air distribution and/or speed of the electric fan and/or button (7) is engaged, the lower led next to button (6) goes out to indicate only partial operation of the automatic function.

If the led on button (8) comes on during the automatic functioning of the system, i.e. when the air recirculation is activated, by pressing this button air recirculation is shut off and outside air circulation is activated instead, indicated by the above mentioned led going out.

If button (8) is pushed when the relative led is out (circulation of external air), the led mentioned above will come on and the recirculation of passenger compartment air will be activated.

The recirculation function is also activated automatically by the system under particular conditions, for example, if the external air temperature is very high.

The two leds next to button (6) come on to indicate automatic functioning of the system but only the upper led comes on to indicate semi-automatic operation. The desired passenger compartment air temperature can be set by acting on button (3) and the value appears on the upper display (1).

Each time one of the number (3) buttons is pressed only one unit of the temperature value will be varied on the display. The temperature value which can be set on the display can be chosen from between 18 °C and 32 °C or between 64 °F and 89 °F for control units set for degrees Fahrenheit.

When the temperature on the display reads 18 °C, if the left-hand button (3) is pressed the letters LO will appear on the display. In this situation the system reverts to a fixed setting which supplies the lowest temperature possible.

When the displayed temperature value is 32 °C, if the right-hand button is pressed (3) the letters HI will appear on the display. In this situation the system reverts to a fixed setting which supplies the highest temperature possible.

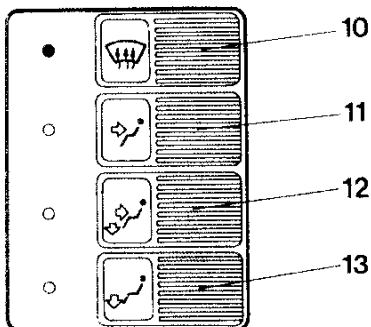
The speed of the electric fan is continuously controlled by the control unit and any variation is indicated on the display (4) by the progressive illumination of the 7 leds in addition to the first which is always on. By acting on button (5) the desired speed can be set and the previous manual or automatic setting is cancelled.

If the preceding fan speed was set automatically by the system, the lower led next to button (6) will go out when button (5) is pressed and the words MANUAL will light up.



Air distribution to the various outlets and diffusers is continuously controlled by the automatic function which rotates the two air distribution vents from the positions corresponding to button (10) to those corresponding to button (13) indicating its choice by illuminating the led on the relative button.

During winter heating the automatic function can set the two air distribution vents to the angle corresponding to button (10).



By pressing one of the four buttons the automatically selected air distribution can be varied. If the fan speed or the recirculation function have not been varied the lower led next to the button goes out.

Pushing the button again will hand over control of the air distribution vents to the automatic function. Distribution of the air to the various outlets and diffusers can easily be seen by observing the direction of the arrows on the ideograms on each button.

By pushing button (2) located on the right-hand side of the upper display the external air temperature will appear on the upper display.

This value is distinguished by the letters EXT (external) and will stay on for about ten seconds after which the selected air temperature value within the passenger compartment will appear. The external air temperatures which can be indicated by the upper display range from -30 °C to 50 °C or from -22 °F to 122 °F.

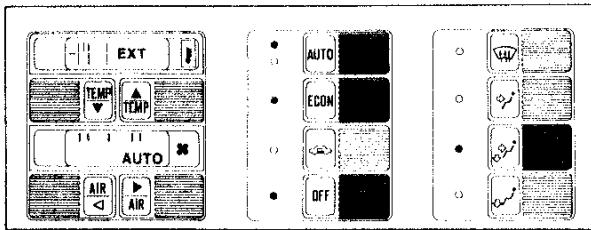


SELF-DIAGNOSIS

Follow the operations for each phase in order.

First phase

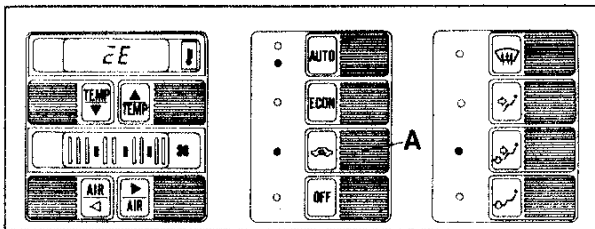
Rotate the ignition key from the STOP position to the MAR position at the same time holding the AUTO button in. The indications shown in the figure below should appear on the two displays and the leds of the buttons indicated by hatching should come on.



Push the button indicated by the letter A.

The indications represented in the figure below should appear on the two displays and the leds indicated should come on.

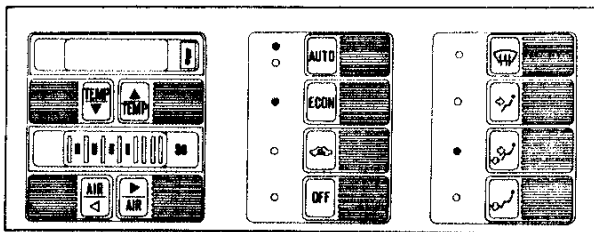
By pressing button A a second time the system returns to the previous condition.



Second phase

1. Press the AUTO button.

The indications illustrated in the figure below should appear on the lower display.



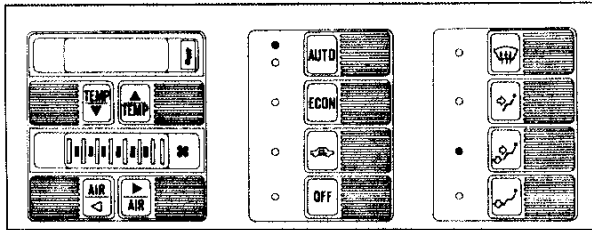
2. Press the various buttons illustrated in the table below in order and check that the relative code appears on the upper display for each one.

| BUTTON | RELATIVE CODE |
|--------|---------------|
| | 5 |
| | 6 |
| | 7 |
| | 2 |
| | 4 |
| | d |
| | 7 |
| | 9 |
| | b |
| | c |
| | A |
| | E |

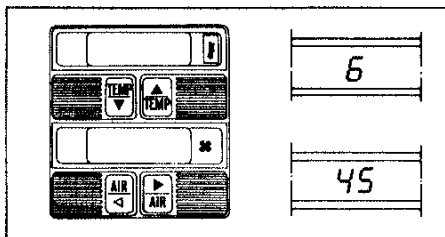


Third phase

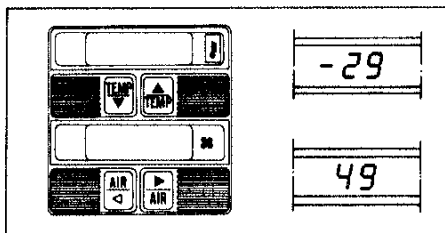
1. Press the AUTO button. The indications illustrated in the figure below should appear on the lower display (6 bars).



2. Press the AIR button with the arrow pointing left. The temperature inside the passenger compartment should appear on the upper display. A value of 06 or 6 indicates that the sensor or its circuit is interrupted. If the number 45 appears the sensor or the cables connected to it are short-circuiting.



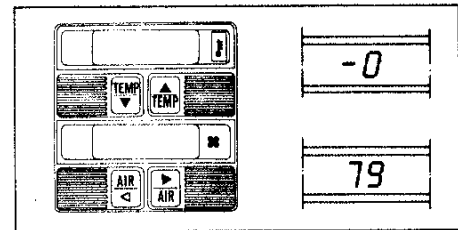
3. Press the AIR button with the arrow pointing right. The external air temperature should appear on the upper display. If the number 29 appears the sensor or its circuit are interrupted. If the number 49 appears the sensor or cables connected to it are short-circuiting.



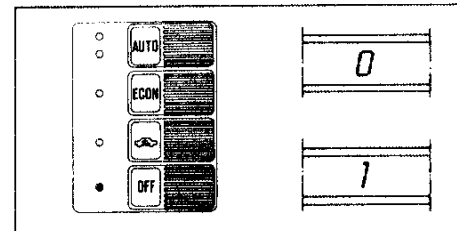
4. Press the TEMP buttons, first the one on the right and then the one on the left.

The mixed air temperature value measured in the upper and that of the lower parts respectively of the heating-distribution unit should appear on the upper display.

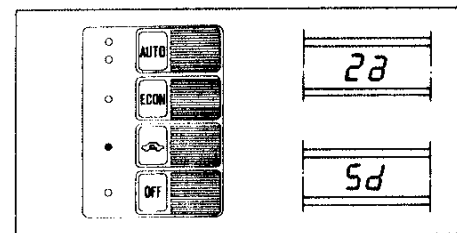
If, for one of the two sensors, a value of -00 or -0 appears, the sensor or its circuit is interrupted. If a value of 79 appears, the sensor in question or the cables connected to it are short-circuiting.



5. Press the OFF button. If the vehicle is stationary 0 should appear on the display or 1 if the vehicle is travelling at a speed above 30 Kph.

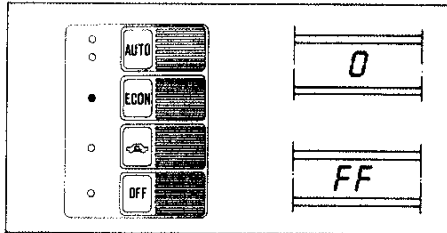


6. Press the air recirculation button. A value between 2a and d5 should appear on the upper display. This value represents the position of the air distribution vents.



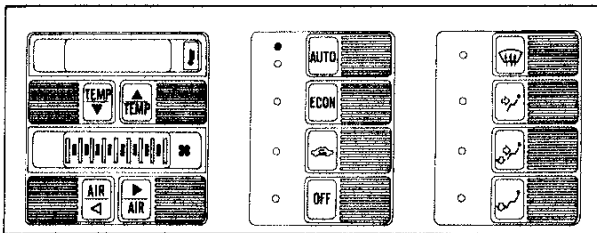


7. Press the ECON button. The passenger compartment air fan speed electronic variator temperature value should appear on the upper display (any number can appear depending on the position at that moment of the electronic speed variator). If the code 0 appears the sensor or its circuits are interrupted. If the code FF appears the sensor or cables connected to it are short-circuiting.

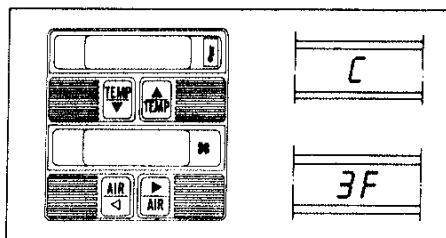


Fourth phase

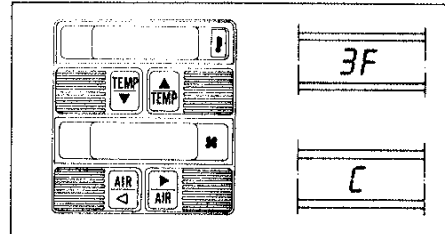
1. Press the AUTO button. The indications illustrated in the figure below should appear on the lower display (8 bars).



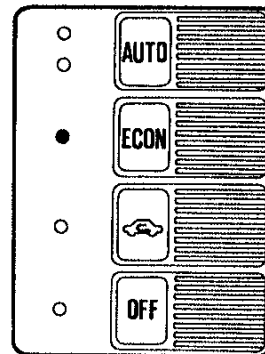
2. By repeatedly pressing the right-hand AIR button 26 codes, from C to 3F, should appear in sequence on the display and the electric fan should be heard to gradually increase in speed.



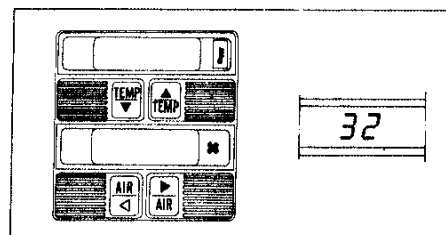
3. By repeatedly pressing the left-hand AIR button 26 codes, from 3F to C, should appear in sequence on the display and the electric fan should be heard to gradually decrease in speed.



4. By repeatedly pressing the ECON button the electromagnetic coupling of the compressor pulley should be activated and disengaged and the relative led should come on and go off.

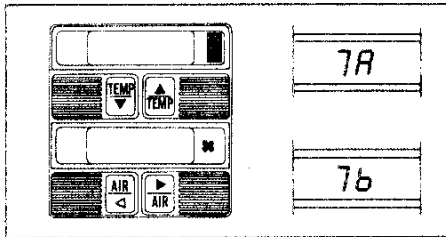


5. Press the left-hand TEMP button. A series of codes up to a maximum of 32 should appear on the display. These codes identify the maximum cold position of the mixed air vent (engine coolant tap closed).

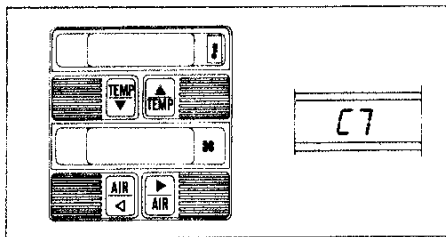




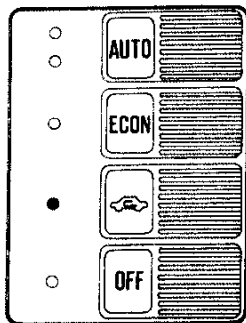
- 6. Press the button indicated by the hatching in the figure below. A sequence of codes up to a maximum of 7A or 7b should appear on the display. These codes correspond to the total opening of the tap on the inlet duct of the heater and to the maximum cold position of the air mixing vent.



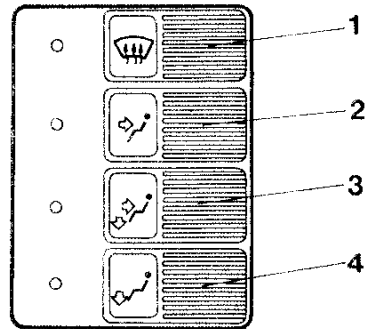
- 7. Press the right-hand TEMP button. A series of codes up to a maximum of C7 should appear on the display. These codes identify the maximum heat position of the mixed air vent (engine coolant tap fully open).



- 8. By pressing the recirculation button, the led on the button should come on and the air recirculation function should be activated.



- 9. Pressing the recirculation button a second time should extinguish the relative led and the circulation of external air should be activated.
- 10. Press buttons 1 - 4 in succession. For each button the relative led should come on and a sequence of codes should appear on the upper display until they remain stationary for each button. This will indicate a specific position of the air distribution vents.



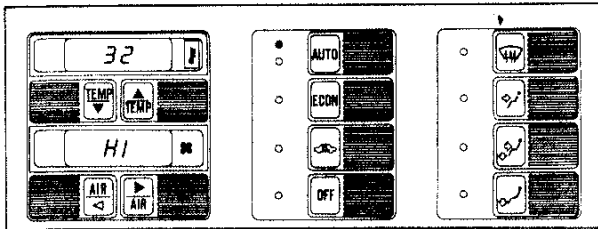
The codes connected to each button are given in the table below.

| BUTTON | RELATIVE CODE |
|--------|---------------|
| | |
| | |
| | |
| | |

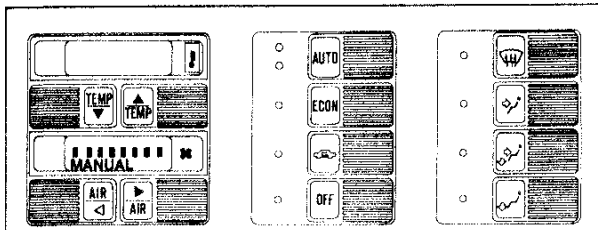
After this last self-diagnosis operation press the AUTO button to return the system to normal operation.

**MEMORY CONTROL**

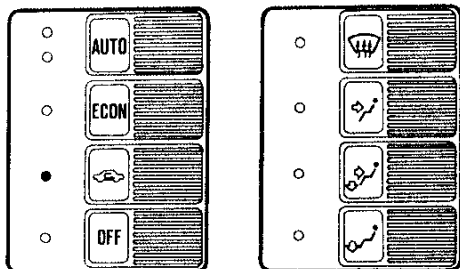
1. Turn the ignition key to the MAR position.
2. Press the AUTO button.
3. Repeatedly press the right-hand TEMP button until the lower display, electric fan speed, shows the letters HI.



4. Press the right-hand AIR button until the maximum speed of the electric fan is reached and 8 bars appear on the lower display.



5. Press the recirculation button and one of the buttons of the right-hand column, different from that selected automatically.



6. Turn the ignition key to the STOP position and then, after a few moments, return it to the MAR position. The previously selected settings which have been memorized must return to the operational state without variation, i.e., the set temperature HI, maximum fan speed, air recirculation and a certain distribution.



OPERATIONS TO BE CARRIED OUT ON THE BASIS OF THE RESULTS OBTAINED FROM THE SELF-DIAGNOSIS TESTS

If one or more of the segments or one or more of the leds relative to the buttons stays out, or the codes relative

to each button do not appear during the first and second phases of the self-diagnosis test, replace the electronic control unit. Refer to the table below for the third phase of the self-diagnosis.

| BUTTON | DISPLAYED DATA | OPERATION TO BE CARRIED OUT | DISPLAYED DATA | OPERATION TO BE CARRIED OUT |
|------------------------|---|--|----------------|-----------------------------|
| LEFT-HAND AIR BUTTON | Passenger compartment air temperature differs by $\pm 1^{\circ}\text{C}$ from the actual temp. | Replace the sensor and if the anomaly persists replace the electronic unit | | |
| | 6 | 6 A | C 45 | Replace the sensor |
| | 45 | B | 6 45 | Replace the sensor D |
| | | | | |
| RIGHT-HAND AIR BUTTON | External air temperature differs by $\pm 1^{\circ}\text{C}$ from the actual temp. | Replace the sensor and if the anomaly persists replace the electronic unit | | |
| | -29 | A | -29 49 | C Replace the sensor |
| | 49 | B | -29 49 | Replace the sensor D |
| | | | | |
| LEFT-HAND TEMP BUTTON | Air temperature in the upper part of the heating-distribution unit differs by $\pm 1^{\circ}\text{C}$ from the actual temp. | Replace the sensor and if the anomaly persists replace the electronic unit | | |
| | -0 | A | -0 79 | C Replace the sensor |
| | 79 | B | -0 79 | Replace the sensor D |
| | | | | |
| RIGHT-HAND TEMP BUTTON | Air temperature in the lower part of the heating-distribution unit differs by $\pm 1^{\circ}\text{C}$ from the actual temp. | Replace the sensor and if the anomaly persists replace the electronic unit | | |
| | -0 | A | -0 70 | C Replace the sensor |
| | 79 | B | -0 79 | Replace the sensor D |
| | | | | |
| ECON BUTTON | Electronic fan speed variator temperature differing by $\pm 1^{\circ}\text{C}$ from the real value | Substitute the electronic fan speed variator | | |
| | 0 | A | 0 FF | C E |
| | FF | B | 0 F | E D |
| | | | | |



- A. Disconnect the electrical connection from the terminal cables of the sensor and, using a jumper connection, connect the two cables supplying the sensor.
- B. Disconnect the electrical connection from the terminal cables of the sensor.
- C. Replace the interrupted cable or cables connecting the sensor to the control unit and replace the control unit if no interruption is found.
- D. Check and/or replace the positive cable which may have been accidentally connected to earth. If no anomalies are found replace the electronic unit.
- E. Replace the electronic speed variator of the electric fan.

In the fourth phase of the self-diagnosis a few anomalies may be encountered, namely:

- electric fan not running at all speeds;
- compressor does not cut in;
- electric actuators not working or partly working;
- electric actuators working perfectly but codes differing from those stated appear on the display.
- In the first two situations check the power supply to the electric fan and compressor.

In the third situation check the efficiency of the actuators and if they are working correctly replace the electric unit after checking the integrity and insulation of the cables connecting the two parts.

In the fourth situation, if the number of codes appearing in sequence on the display is equal to the number which should appear, adjust the micrometric regulation screws on the position transducer.

NOTE: This last operation must be carried out only if the codes differ by only one unit. In all other cases replace the affected actuator.



DESCRIPTION OF THE MAIN COMPONENTS OF THE CONDITIONER SYSTEM

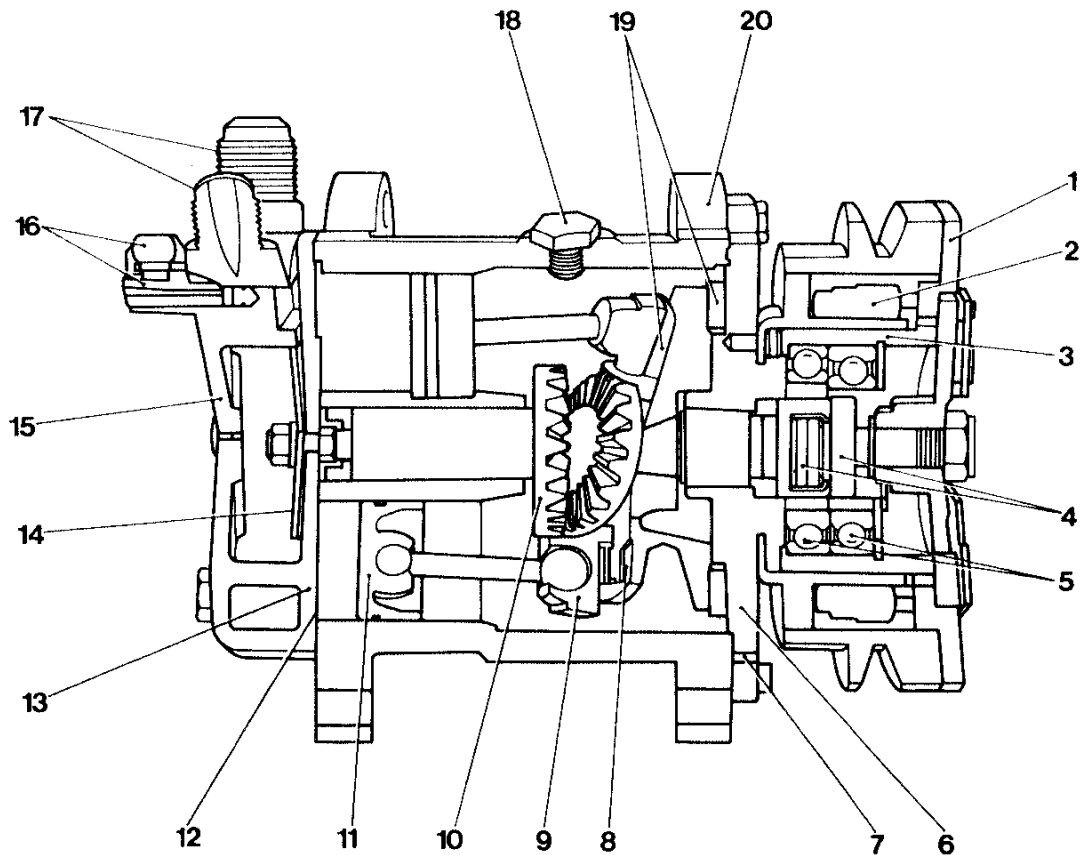
Compressor

The compressor is of the SANDEN SD-709 type and is illustrated in the figure below. It is composed of:

- a block (20);
- seven pistons and relative rods;
- a plate with automatic one-way delivery and intake blade valves;
- a cylinder head with intake and exhaust ducts.

The alternating motion needed for the pistons and relative liners to slide is obtained through the rotary motion of a tilted plane (rotor 8) supporting a plate (9), spaced by rollers (18). The plate is connected to ball joints and the piston rods (11). It cannot rotate and articulates by way of two toothed wheels (10).

1. Clutch disk
2. Solenoid
3. Rotor with pulley
4. Seal ring assembly
5. Ball bearing
6. Front plate
7. Seal ring
8. Rotor
9. Rod plate
10. Anti-rotational gear
11. Piston
12. Gasket for the valve plate
13. Valve plate
14. Cylinder head gasket
15. Cylinder head
16. Service needle valve
17. Intake and delivery ducts
18. Cap for servicing with oil
19. Thrust roller bearings
20. Compressor block



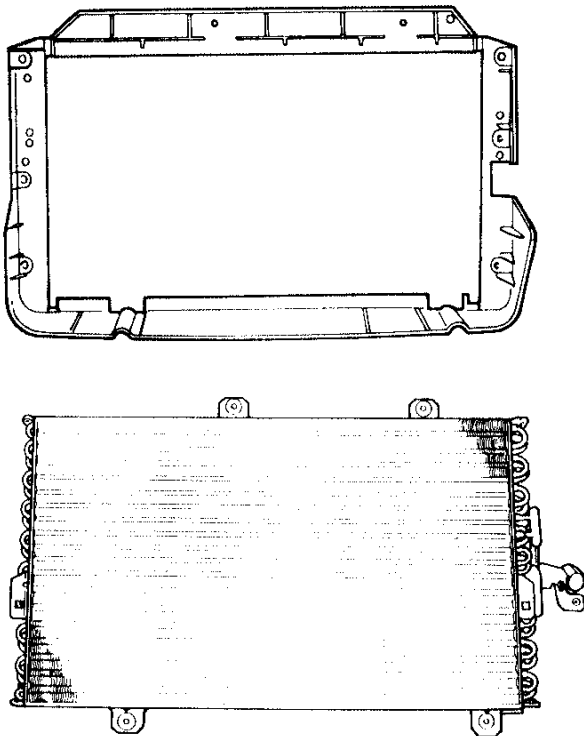


Condenser

The condenser is a heat exchanger composed of copper or aluminium pipes with aluminium blades which increase the surface for heat exchanging.

The FREON 12 in its gaseous state, passing through the bends in the condenser, changes to a liquid (on average at around 60°C). An insufficient exchange of heat in the condenser increases the pressure in the system and prevents the complete condensing of the FREON 12. For this reason gaseous fluid would reach the expansion valve which would greatly decrease the refrigerating capacity of the system.

The condenser is lapped by the air produced from the forward motion of the vehicle or, when the vehicle is stationary or moving slowly, by the air produced by the electric fan.



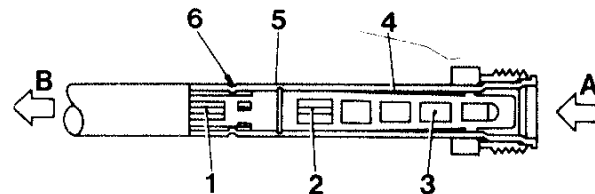
Expansion valve

The expansion valve, more aptly named expansion pipe, is inserted in the evaporator inlet duct.

The valve, which can be seen in the figure below, has a cylindrical form and, apart from the metal inner tube is entirely constructed in plastic.

The two ends of the valve are made of an extremely thin narrow gauge mesh and serve as filters. The pipe has an inner diameter which is calibrated in order to allow the necessary volume of coolant to pass when the compressor is operating.

A rubber ring has been installed on the outer part of the valve and this forms a seal against the inner surface of the evaporator inlet duct.



- A. Entry of Freon 12 from the condenser
- B. Outlet of Freon 12 to the evaporator
- 1. Outlet filter mesh
- 2. Expansion pipe
- 3. Inlet filter mesh
- 4. Evaporator inlet duct
- 5. O-Ring
- 6. Expansion valve assembly supporting tube

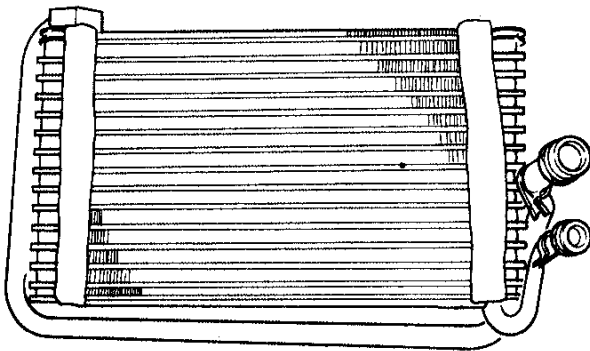


The expansion pipe separates the high pressure side of the system from the low pressure side. The high pressure liquid FREON 12 coming from the condenser expands and decreases in pressure and temperature without changing its state. When the compressor is disengaged the coolant on the high pressure side flows through the expansion pipe to the low pressure side until the two pressures are equal. This reduces the degree of torque necessary to re-start the compressor.

Evaporator

The evaporator is the second heat exchanger of the system and is composed of aluminium pipes and aluminium blades which increase the heat exchange surface. The inlet and outlet ducts to and from the evaporator are welded to the pipe assembly. The evaporator is chemically treated to protect it from corrosion.

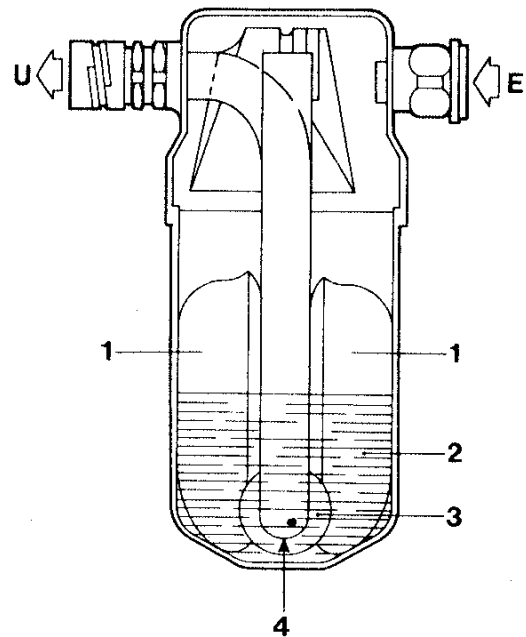
The evaporator is the cooling element of the system and it can be crossed by either the air arriving from the passenger compartment (recirculation) which becomes increasingly cooler and less humid or by external air to provide a change of air in the passenger compartment. As the external or recirculation air crossing the evaporator is at a higher temperature than R 12, the low pressure, low temperature liquid present within the evaporator provokes the evaporation and changes it to a gas (at low pressure). At the same time the air lapping the blades of the evaporator is cooled and dehumidified. The humidity which condenses on the blades of the evaporator is collected and discharged outside the vehicle.



Accumulator-dehydrator

The accumulator-dehydrator, illustrated in the figure below, is connected by a pipe to the evaporator outlet duct and from it receives FREON 12 mainly in a gaseous state and antifreeze oil. The main role of the accumulator-dehydrator is to act as a separator between the coolant in its liquid state and that in a gaseous state. It also serves as a reserve tank and collects most of the FREON 12 (in its liquid state) during operation of the system.

It also serves as a dehydrator and employs pockets of SILICAGEL located in the lower part of the accumulator. These pockets dry out any humidity present in the system. For this reason it is necessary for these accumulators to be stored in a dry environment and kept sealed until they are ready to be installed.



- E. Entry from evaporator
- U. Exit to compressor
- 1. SILICAGEL pockets
- 2. Refrigerating FREON 12 in a liquid state
- 3. Filter
- 4. Opening for return of oil to compressor

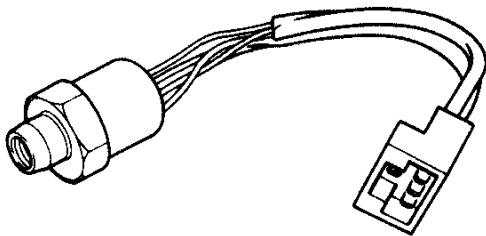


In the lower part of the shaped pipe located inside the accumulator, and in connection with its outlet pipe, there is a hole which ensures that the antifreeze oil returns to the compressor. On this shaped pipe, over the hole, is a metal mesh filter ring.

Three-level pressure switch

The three-level pressure switch operates the electric fan of the condenser and radiator when the vehicle is stationary or only moving slowly. As there is no flow of air provoked by the forward motion of the vehicle it is necessary to condense the FREON 12 with forced ventilation.

It also serves to deactivate the electromagnetic coupling of the compressor pulley when the pressure (high pressure side) reaches dangerous levels in spite of the condenser-radiator electric fan, or when the pressure falls below 2.5 bars due to a possible leak in the system or an outside temperature of below 10 °C (and there is not enough heat to evaporate the FREON 12).



Defroster pressure switch

The defroster pressure switch deactivates the electromagnetic coupling of the compressor pulley when the pressure in the accumulator reaches an average value of 1.72 bars. It reactivates it when the pressure reaches an average of 3.17 bars. This function is carried out to maintain the required temperature and to prevent the evaporator from freezing.

It also protects the compressor by disengaging the electromagnetic coupling from its pulley when the coolant, due to a leak, falls below 1.58 bars or when the outside temperature is below 2.7 °C (37 °F).



REMOVAL AND REFITTING

**CAUTION**

Before carrying out any work, disconnect the negative cable from the battery. Drain off the refrigerating fluid before disassembling the system.

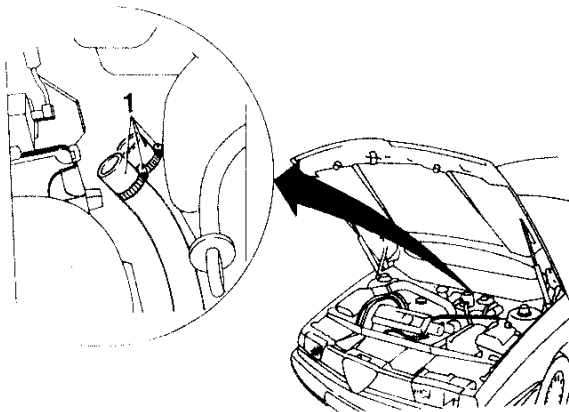
To prevent humidity and dirt from entering the system during maintenance work, plug any detached hoses when disconnecting the components of the air conditioning system.

When refitting the connections on the hoses, always substitute the O-rings. Lubricate the threads on the hose connections with the specified antifreeze oil and tighten to the prescribed torque.

CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT

Removal

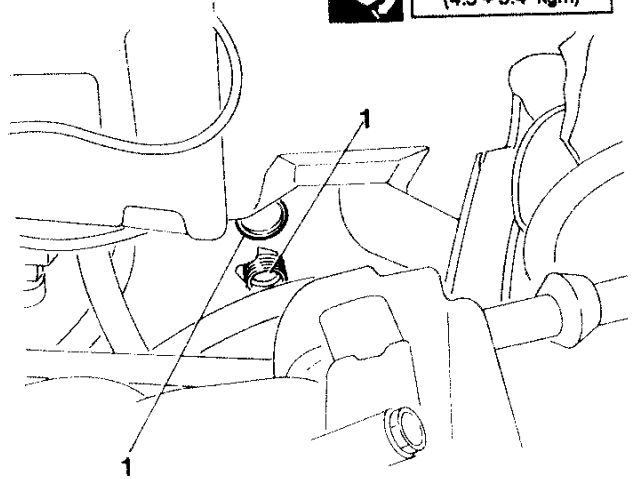
- Disassemble and remove the tunnel console (see GROUP 66).
 - Disassemble and remove the control unit (see relative paragraph).
 - Disassemble and remove the dashboard skirting (see GROUP 66).
1. Loosen the metal clamps securing the two rubber delivery and return hoses carrying the engine coolant to and from the heating/cooling radiator.



- Drain off the Freon (see relative paragraph).
1. Using spanners No. 1.822.111.000 - 1.822.112.000 - 1.822.113.000 and 1.822.115.000, unscrew the freon hoses from the engine compartment.

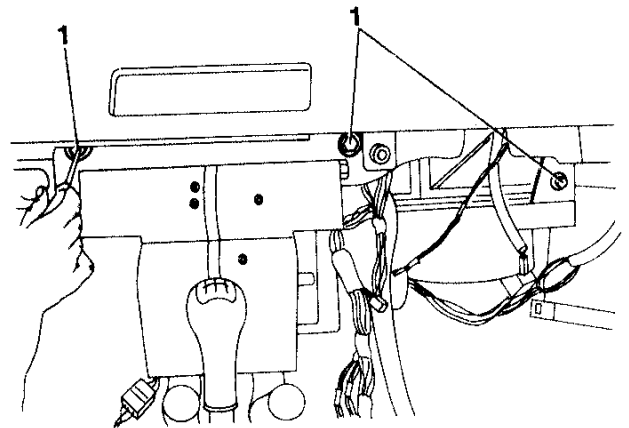


44 + 53 Nm
(4.5 + 5.4 kgm)



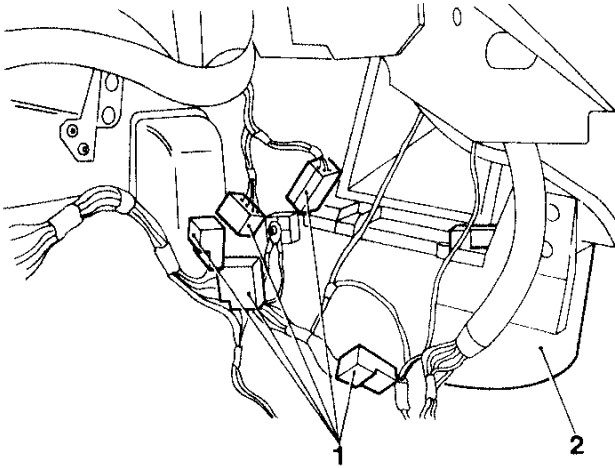
19 + 23 Nm
(1.9 + 2.3 kgm)

1. Loosen the screws securing the group to the frame.





1. Disconnect all the electrical connections including the earths.
2. Remove the assembly paying particular attention to the upper air duct gasket in the dashboard compartment.



Refitting



To refit, reverse the procedure followed for removal.

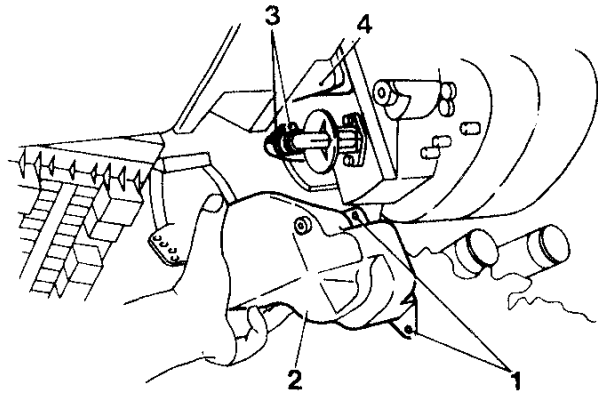
Supplementary indications regarding refitting

- Tighten the connections to the specified torque.

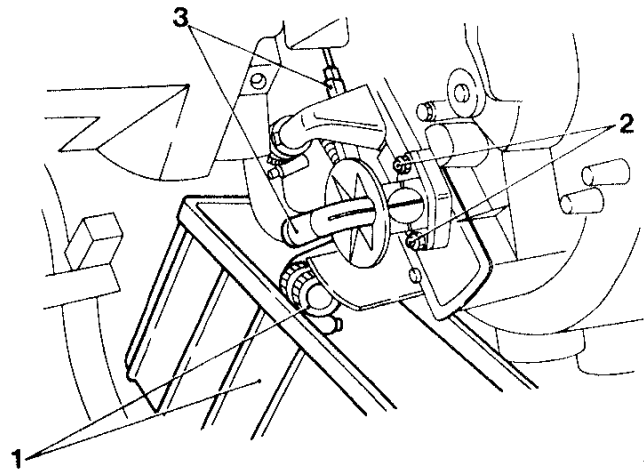
HEATING/COOLING RADIATOR

Removal

1. Working on the left-hand side of the conveyor (driver's side), loosen the two screws on the cover of the heating/cooling radiator.
2. Remove the cover.
3. Loosen the two clamps securing the engine coolant inlet hose to the tap.
4. Loosen the three screws securing the actuator to the assembly and remove the actuator.

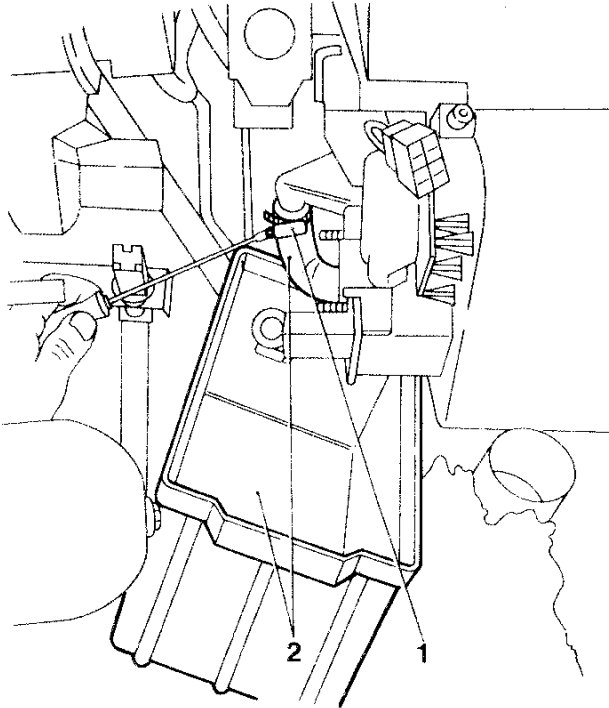


1. Disconnect the hose from the tap taking care not to spill any liquid. Use a container to catch any drips.
2. Loosen the two nuts securing the tap to the radiator.
3. Remove the tap together with the relative control levers.

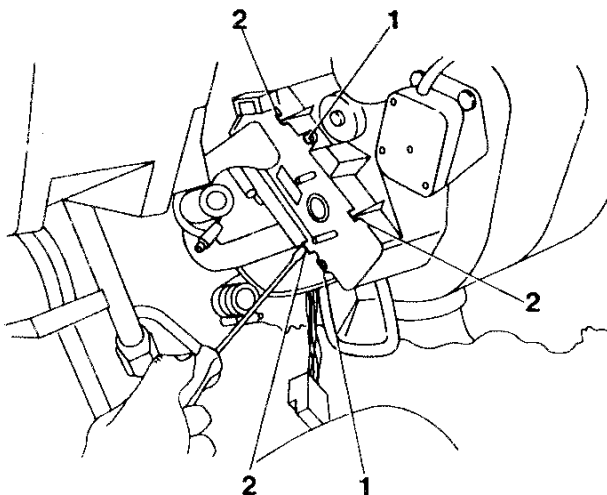




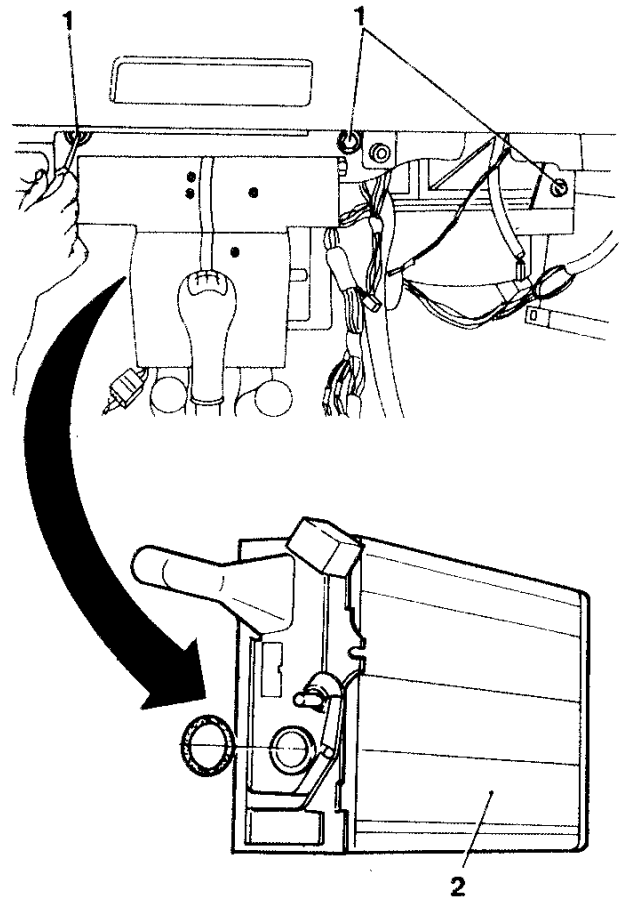
1. Loosen the clamp securing the upper engine coolant outlet hose from the heating/cooling radiator.
2. Disconnect the hose taking care not to spill any liquid. Use a container to catch any drips.



1. Loosen the two screws securing the heating/cooling radiator to the assembly.
2. Act on the tabs.



1. Loosen the three upper screws securing the conveyor assembly to the frame.
2. Remove the heating/cooling radiator from the driver's side by moving the entire unit and the main fusebox slightly downwards.



Refitting



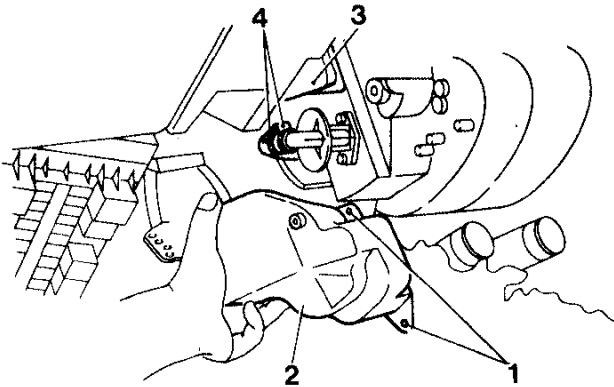
To refit, reverse the procedure followed for removal.



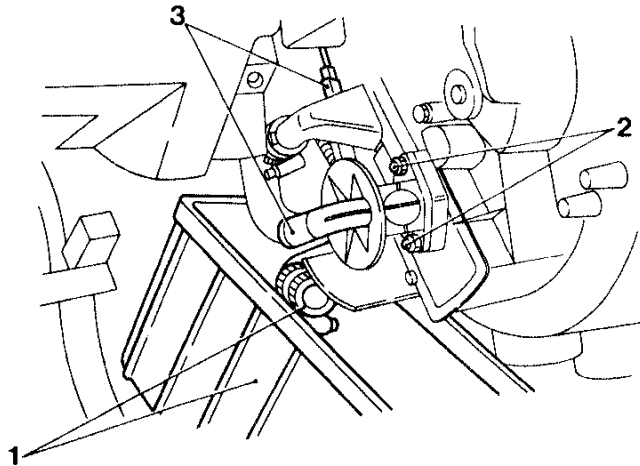
TAP REGULATING THE FLOW OF ENGINE COOLANT INTO THE HEATING/COOLING RADIATOR

Removal

1. Working on the left-hand side of the conveyor assembly (driver's side), loosen the two screws on the cover of the heating/cooling radiator.
2. Remove the cover.
3. Loosen the three screws securing the tap control motor to the assembly and remove it.
4. Loosen the two clamps securing the engine coolant inlet hose to the tap.



1. Disconnect the hose taking care not to spill any liquid. Use a container to catch any drips.
2. Loosen the two nuts securing the tap to the radiator.
3. Remove the tap together with the relative control levers.



Refitting



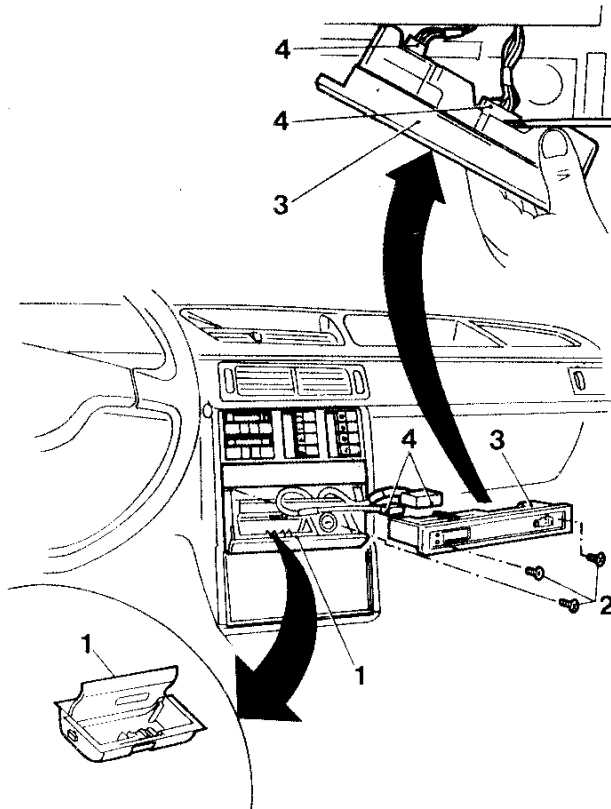
To refit, reverse the procedure followed for removal.



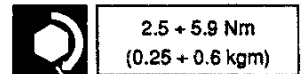
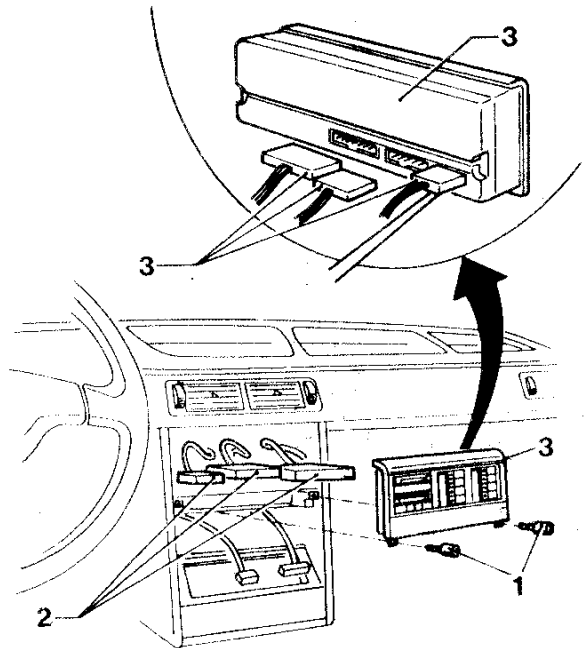
ELECTRONIC CONTROL UNIT

Removal

1. Remove the ashtray.
2. Loosen the three screws securing the Check Panel.
3. Pull out the Check Panel.
4. Disconnect the connectors and remove the Check Panel.



1. Loosen the two screws securing the control unit to the front covering of the central console.
2. Disconnect the three connectors from the control unit.
3. Remove the control unit.



2.5 + 5.9 Nm
(0.25 + 0.6 kgm)

Refitting



To refit, reverse the procedure followed for removal.

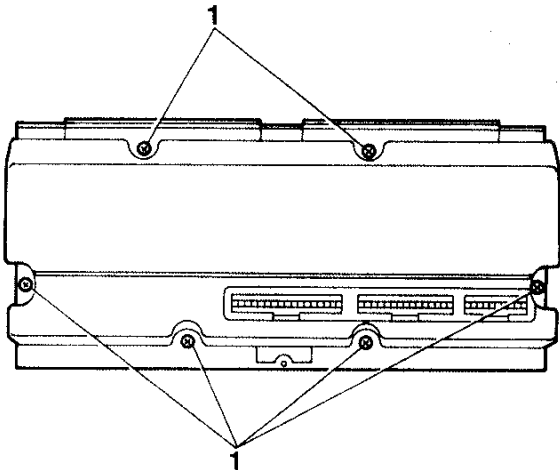
Supplementary Information regarding refitting

- Tighten the screws to the correct torque.

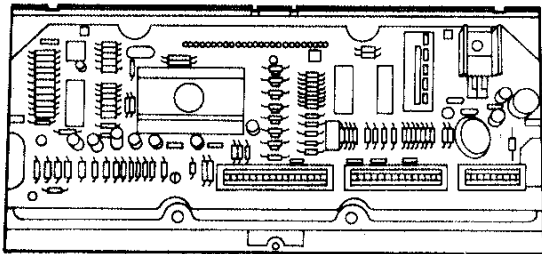


DISASSEMBLY OF THE ELECTRONIC CONTROL UNIT

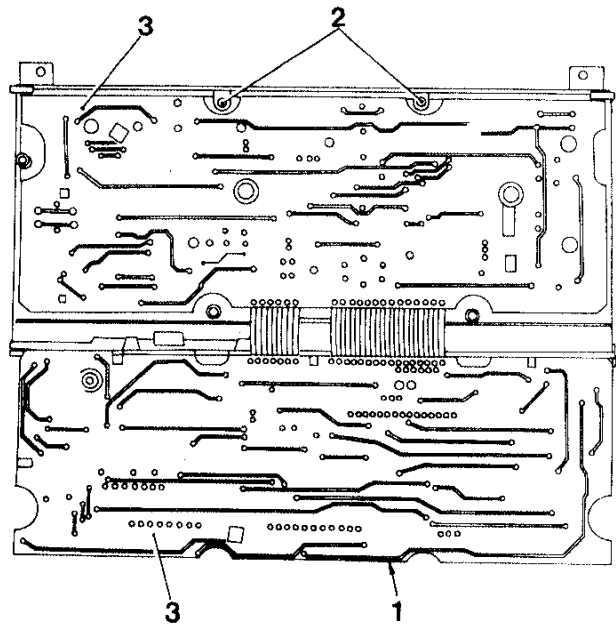
Disassembly



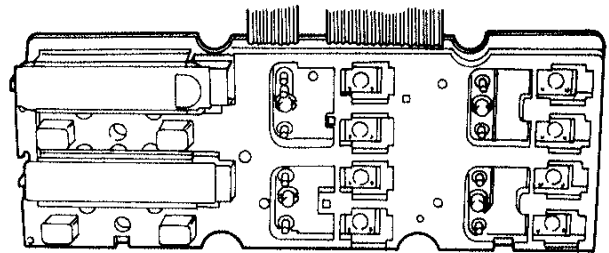
1. Loosen the screws securing the cover.
Detail of the rear side of the electronic control unit with cover removed.



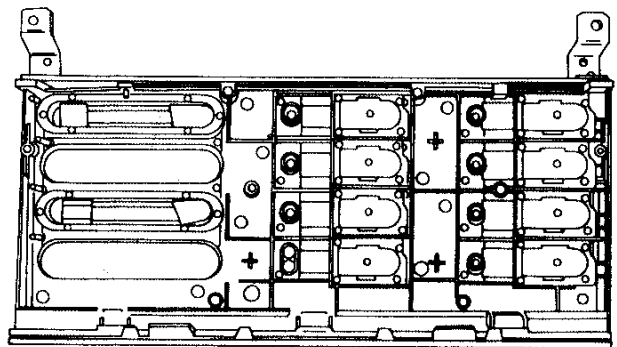
1. Tip the first printed circuit outwards.
2. Loosen the screws securing the second printed circuit to the control unit moulding.
3. Remove the two printed circuits from the control unit moulding.



Detail of the reverse side of the second printed circuit.



Detail showing rear side of moulding.



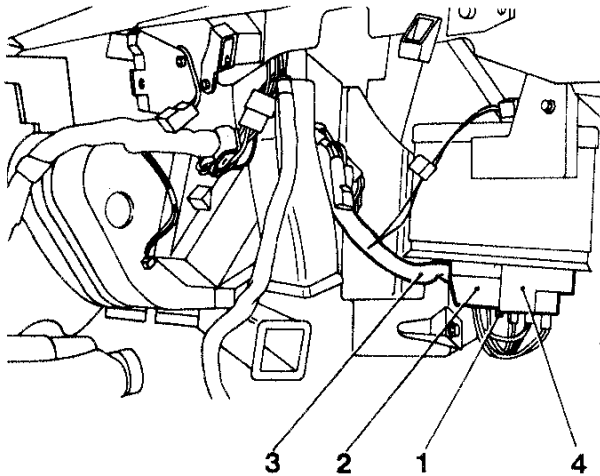
Reassembling the electronic control unit



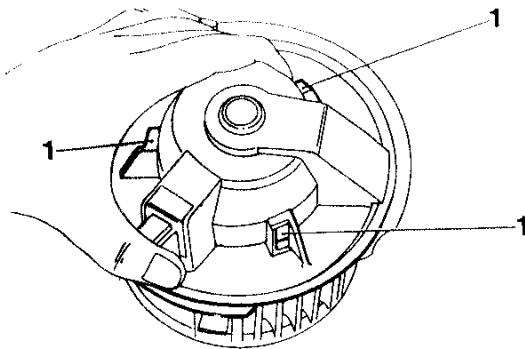
To reassemble, reverse the procedure followed for disassembly.

**ELECTRIC FAN****Removal**

- Working through the compartment below the dashboard, on the right-hand side, proceed as follows.
- 1. Using a thin-bladed screwdriver raise the tab.
- 2. Rotate the rear block of the fan a few degrees anticlockwise.
- 3. Disconnect the electric fan power supply connector.
- 4. Remove the fan block.



1. Using a screwdriver, press the three rubber clips on the fan and remove the cover.

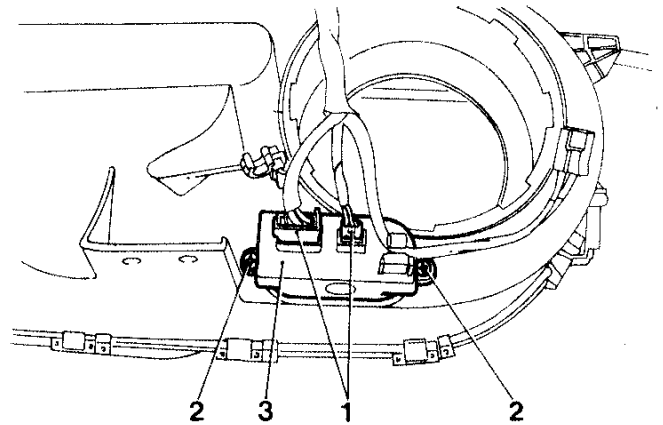
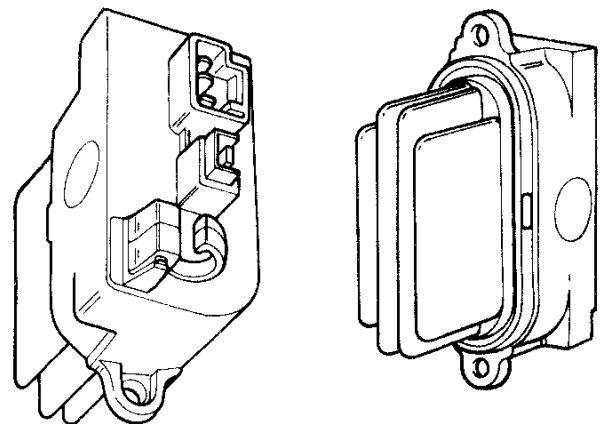
**Refitting**

To refit, reverse the procedure followed for removal.

PA4655D100000

ELECTRONIC FAN-SPEED VARIATOR WITH BUILT-IN TEMPERATURE SENSOR**Removal**

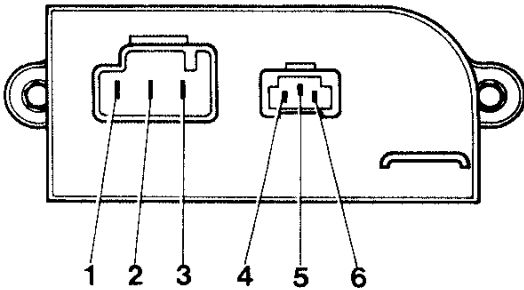
- Working through the compartment below the dashboard, on the right-hand side, proceed as follows.
- 1. Disengage the two electrical connectors from the variator.
- 2. Loosen the two screws securing the variator to the lower part of the heating-distribution unit in the housing indicated by the arrow.
- 3. Remove the variator.

**Detail of the variator**

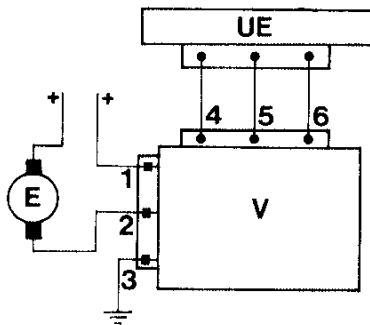
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Detail showing the connector socket on the variator (refer also to wiring diagram)



Wiring diagram showing connections to variator



- UE. Electronic control unit
E. Electric fan
V. Speed variator

Refitting

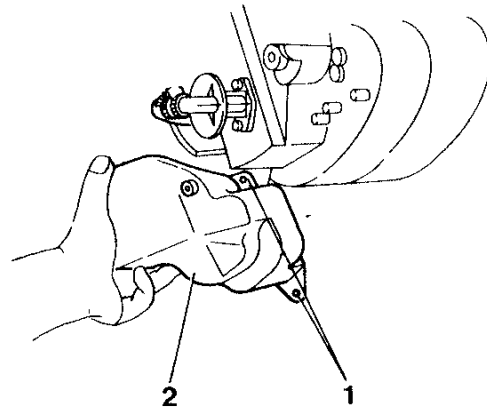


To refit, reverse the procedure followed for removal.

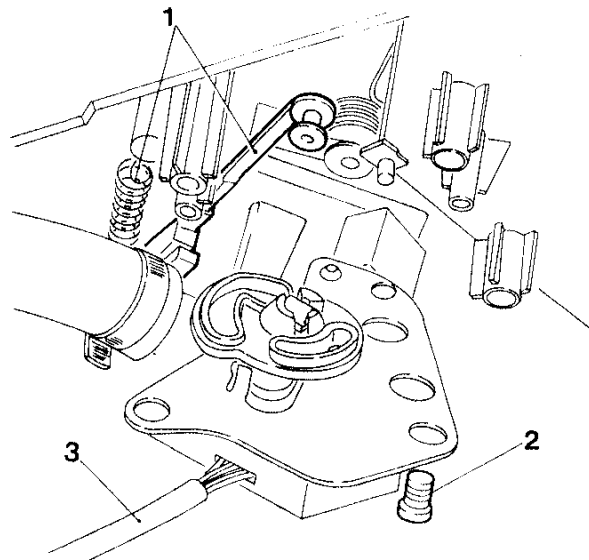
ELECTRIC MOTOR CONTROLLING TAP AND AIR MIXING VENT

Removal

- First proceed with the removal operations given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
1. Loosen the two screws securing the radiator cover.
 2. Remove the cover.

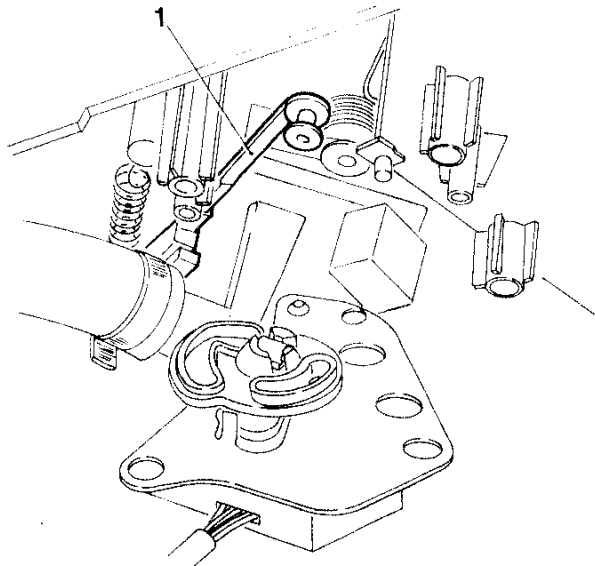


1. Unhook the tie-rod retaining spring.
2. Loosen the screws securing the plate and electronic actuator to the left-hand side wall of the conveyor.
3. Disconnect the electrical connector.





- 1. Disengage the tie-rod from the disk fitted inside the actuator shaft.



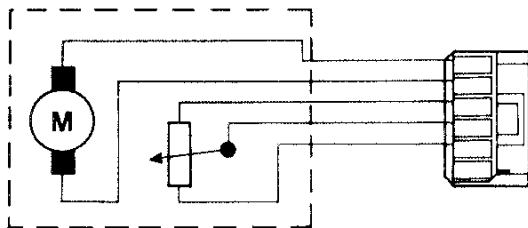
- A. Supply position corresponding to the closed position of the tap
- B. Position corresponding to the tap in the open position and the air mixing vent in the closed position
- C. Position corresponding to the tap in the open position and the air mixing vent fully open.
- K. = $15^\circ \pm 30'$
- Y. = 85°
- Z. = $170^\circ + 175^\circ$

Refitting

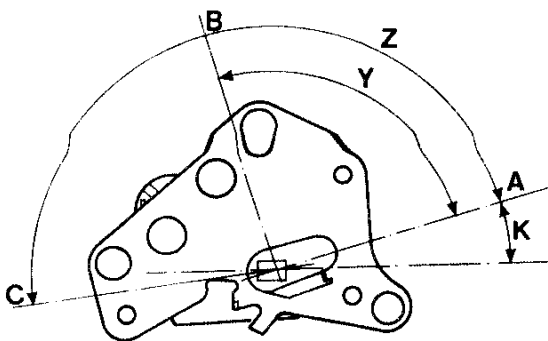


To refit, reverse the procedure followed for removal.

Actuator wiring diagram

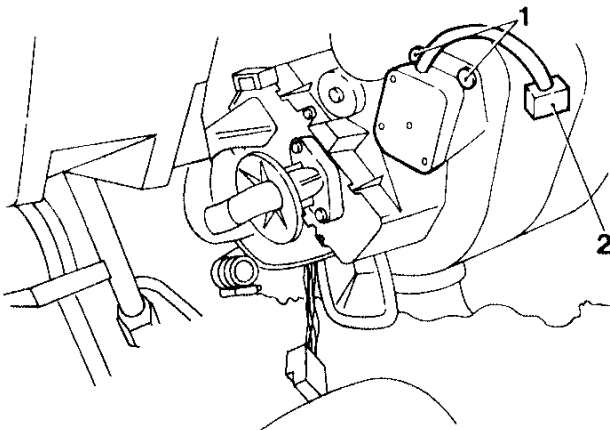


- Diagram showing the positions of the lever installed on the actuator shaft, supplied as a spare part, corresponding to the closure of the tap.

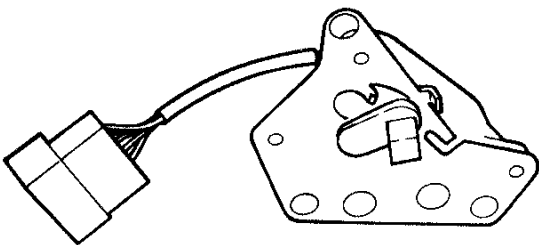


**ELECTRIC MOTOR CONTROLLING THE UPPER AND LOWER AIR DISTRIBUTION VENTS****Removal**

- Working on the left-hand side of the automatic heater under the dashboard (driver's side), proceed as follows.
- 1. Loosen the screws securing the plate and actuator to the left-hand side wall of the heating-distribution unit.
- 2. Disconnect the electrical connector.



Detail of the actuator



Actuator wiring diagram

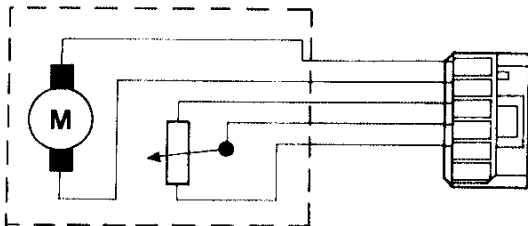
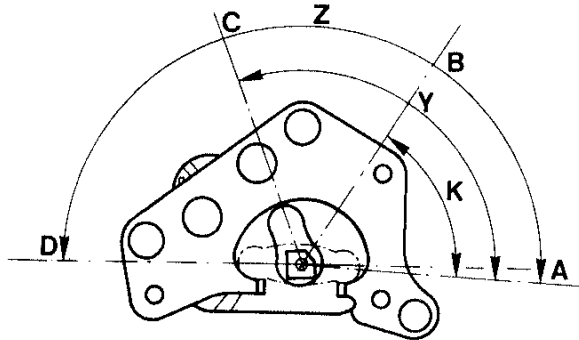


Diagram showing the position assumed by the lever installed on the actuator corresponding to the different types of air distribution



- A. Position corresponding to the the direction of air to the front, central and side outlets
- B. Position corresponding to the direction of air to the floor and to the front, central and side outlets
- C. Supply position corresponding to the direction of air to the floor
- D. Position corresponding to the direction of air to the windscreen diffusors
- K. Angle between positions A and B = 60°
- Y. Angle between positions A and C = $113^\circ \pm 1^\circ$
- Z. Angle between the positions A and D = $183^\circ + 185^\circ$

Refitting

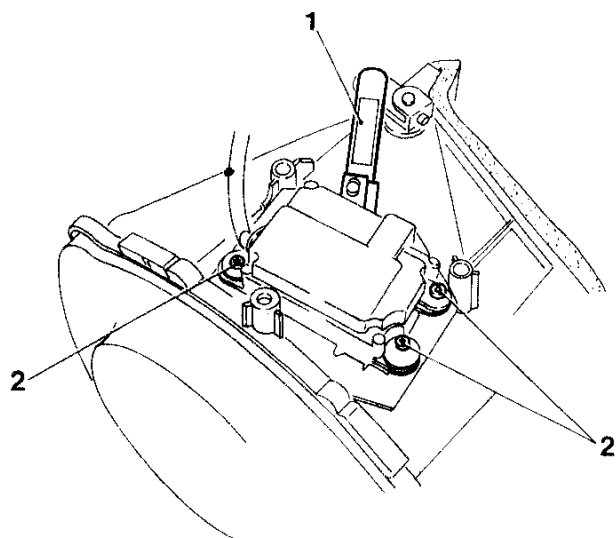
To refit, reverse the procedure followed for removal.



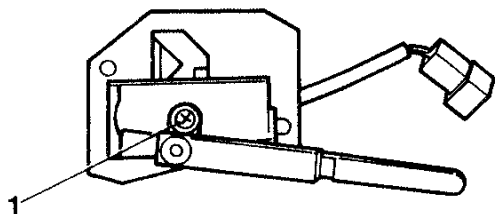
ELECTRIC MOTOR CONTROLLING THE VENT CLOSING OFF THE FLOW OF EXTERNAL AIR (RECIRCULATION)

Removal

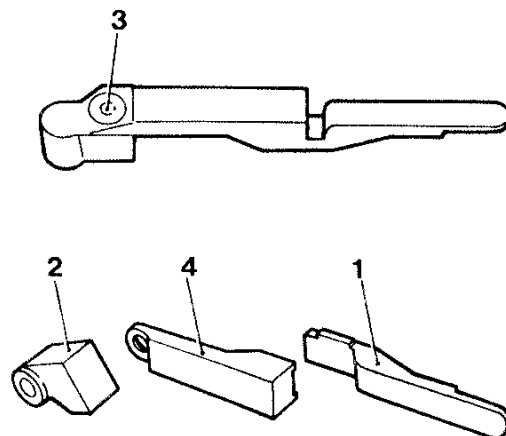
- First carry out the removal procedure given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
- 1. Disengage the upper tie-rod from the air intake vent lever.
- 2. Loosen the screws securing the plate and actuator to the heating-distribution unit.



- 1. Loosen the screw securing the control lever to the actuator.

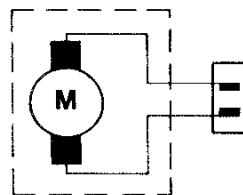


Details showing the air intake vent levers and tie-rods.

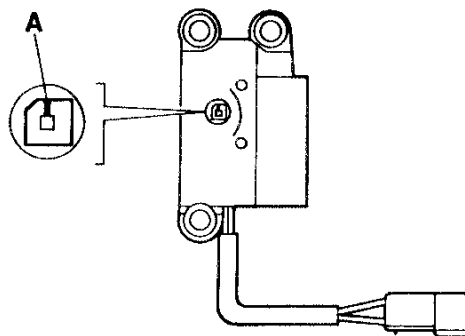


- 1. Upper tie-rod
- 2. Lever
- 3. Screw uniting the lever to the lower tie-rod
- 4. Lower tie-rod

Actuator wiring diagram



The actuator supplied as a spare part has a reference notch (A) located in the position shown



Refitting



To refit, reverse the procedure followed for removal.

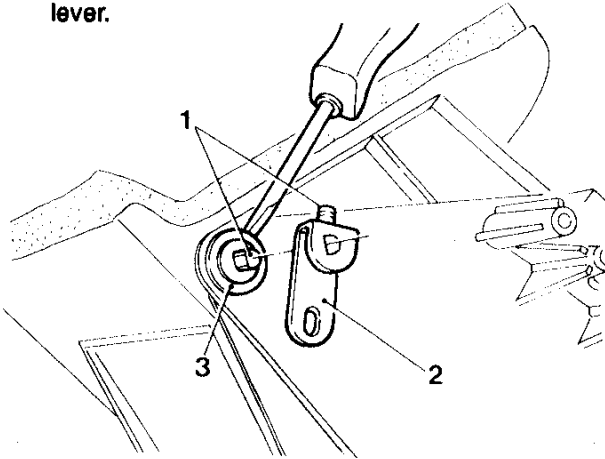


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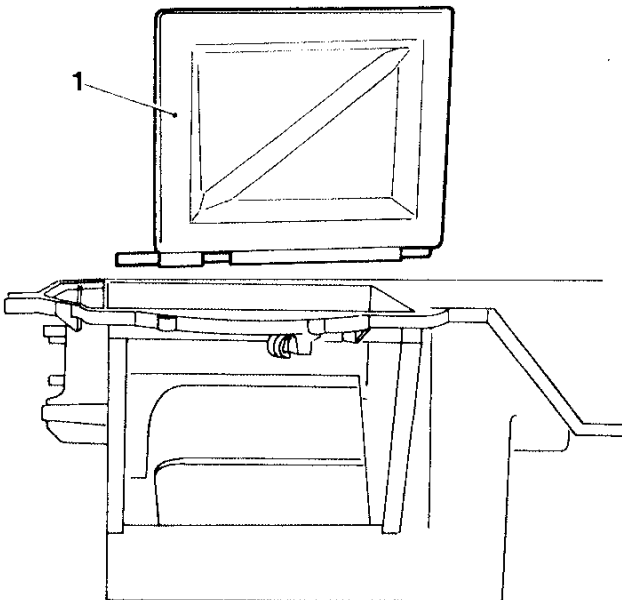
VENT SHUTTING OFF EXTERNAL AIR FLOW (RECIRCULATION)

Removal

- First carry out the removal procedure given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
- 1. Loosen the screw of the bracket fixed to the pin of the vent and actuator.
- 2. Remove the bracket.
- 3. Remove the rubber gasket using a screwdriver as a lever.



1. Remove the vent.



Refitting



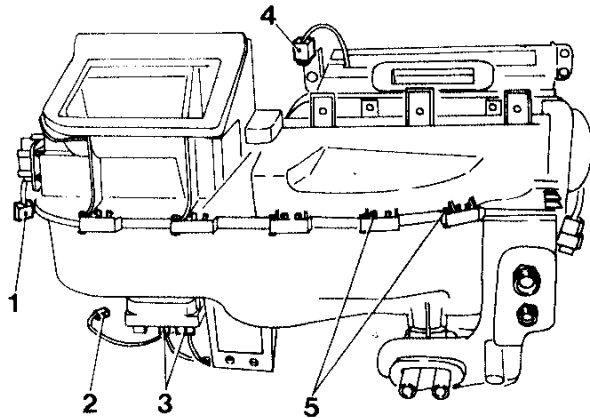
To refit, reverse the procedure followed for removal.

PA4655D100000

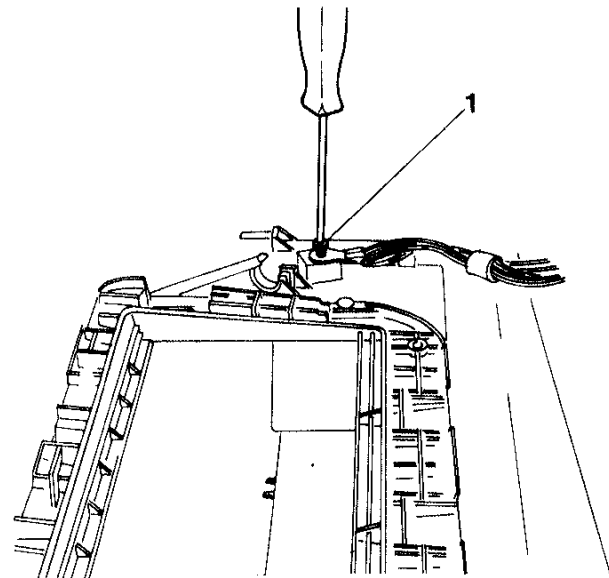
AIR MIXING VENT

Removal

- First carry out the removal procedure given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
- 1. Disconnect the connector from the electronic actuator controlling the external and recirculation air-flow regulation vent.
- 2. Disconnect the connector from the electric fan.
- 3. Detach the two connectors from the electronic fan-speed variator.
- 4. Disconnect the connector from the upper mixed air temperature sensor.
- 5. Loosen the screws securing the upper part of the conveyor (9 on the side and three on the front) and remove it using a thin-bladed screwdriver as a lever to disengage the tabs.



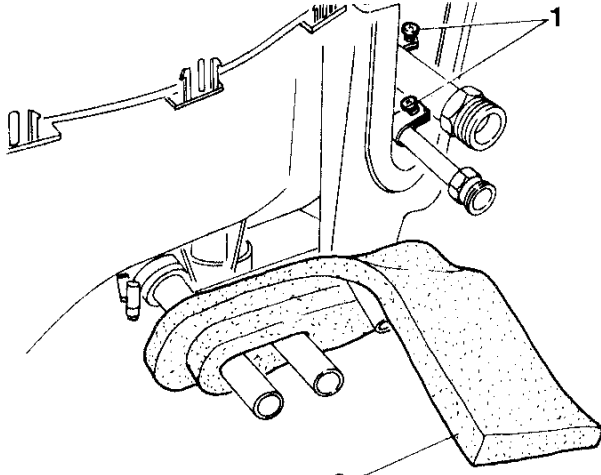
1. Loosen the screw securing the wiring.



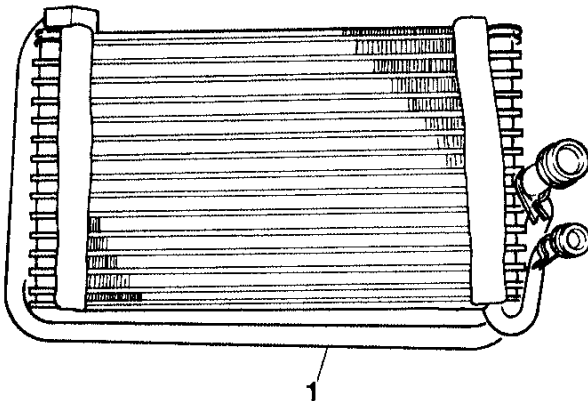
07 - 1991



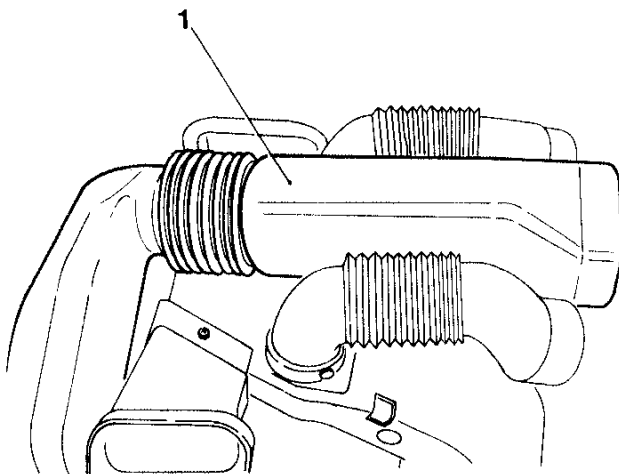
1. Loosen the screws on the clamps securing the inlet and outlet hoses carrying the Freon to and from the evaporator.
2. Remove the sponge protection.



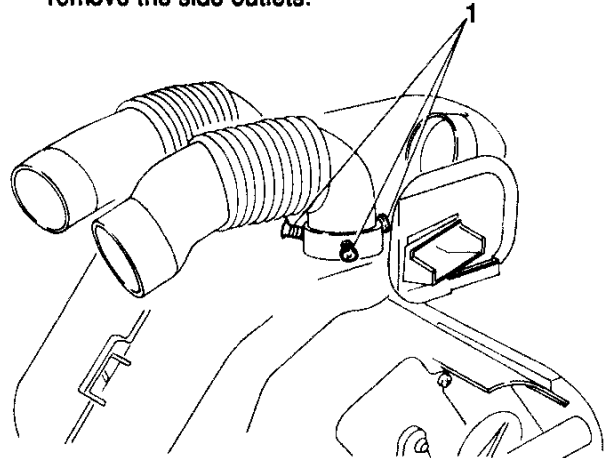
1. Remove the evaporator.



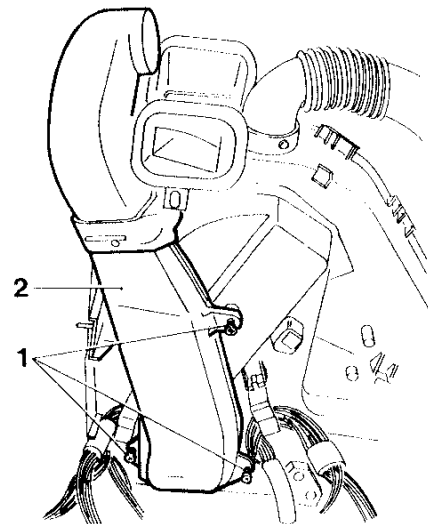
1. Disconnect the central tube carrying air to the tunnel outlets.



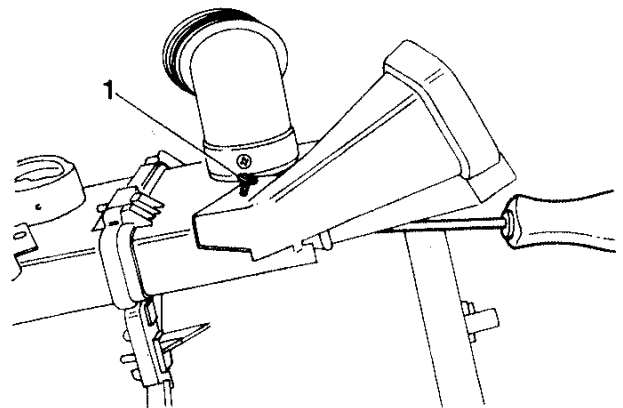
1. Loosen the screws (three for each outlet) and remove the side outlets.



1. Loosen the three screws securing the upper part of the tube delivering air to the tunnel outlets.
2. Remove the tube.

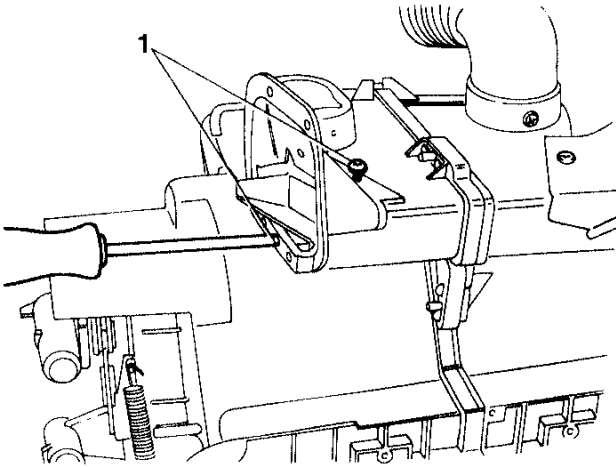


1. Loosen the two screws and remove the right-hand side outlet.

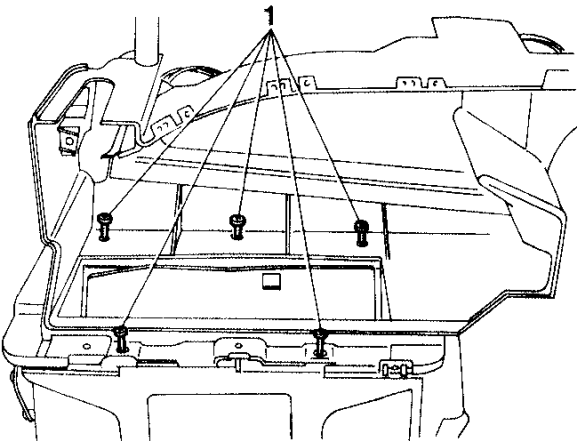




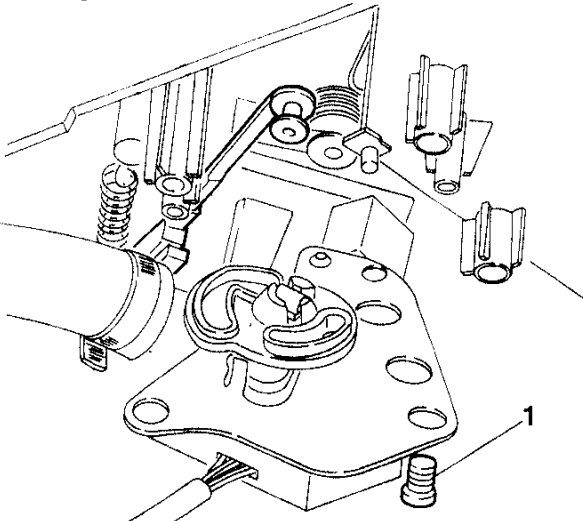
1. Loosen the two screws and remove the left-hand side outlet.



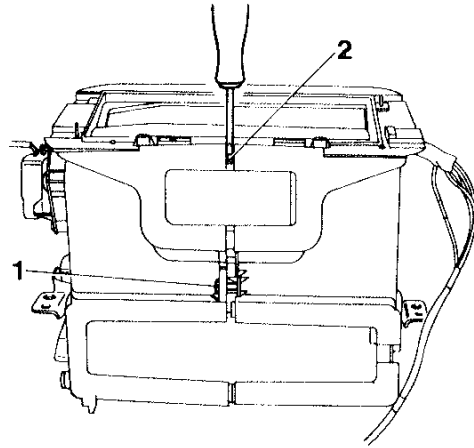
1. Loosen the five screws securing the lower part of the conveyor to the heating-distribution unit and remove the unit.



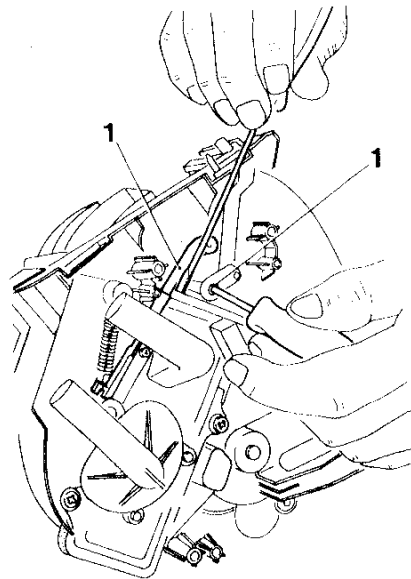
1. Loosen the screws securing the actuator to the air mixing vent and remove the vent.



1. Loosen the screws securing the two casing halves of the heating-distribution unit.
2. Using a screwdriver as a lever separate the two casing halves.

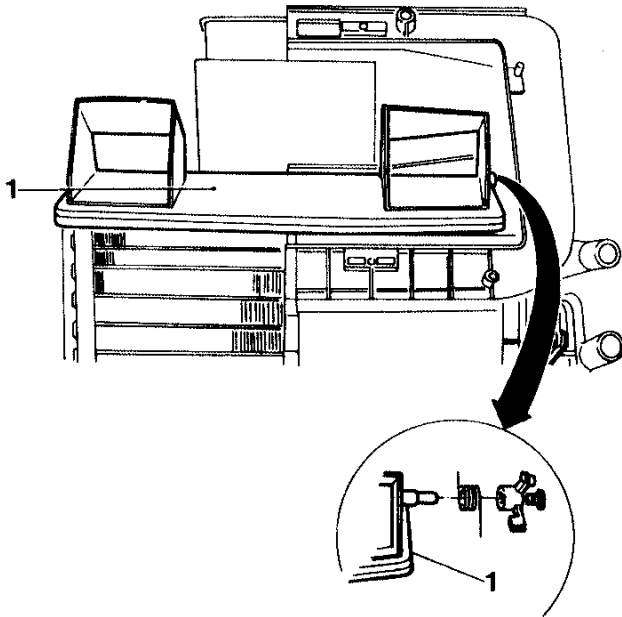


1. Loosen the screw and remove the air mixing vent control lever.





1. Remove the air mixing vent and relative springs.



Refitting

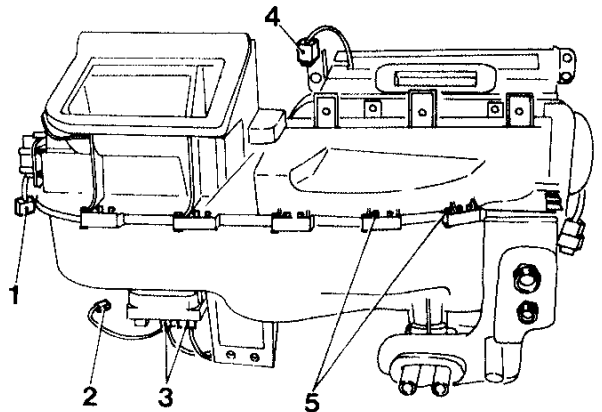


To refit, reverse the procedure followed for removal.

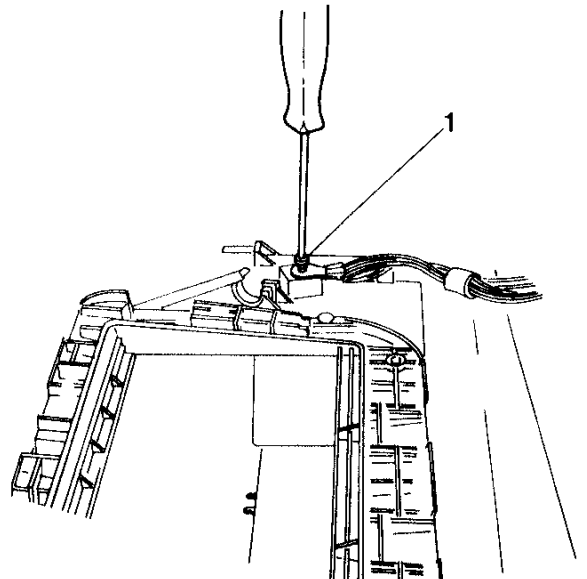
UPPER AIR DISTRIBUTION VENT

Removal

- First carry out the removal procedure given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
1. Disconnect the connector from the electric motor controlling the external and recirculation air flow regulation vent.
 2. Disconnect the connector from the electric fan.
 3. Disconnect the two connectors from the electronic fan-speed variator.
 4. Disconnect the connector from the upper mixed air temperature sensor.
 5. Loosen the screws securing the upper part of the conveyor (9 on the side and 3 on the front) and remove it using a thin-bladed screwdriver as a lever to disengage the tabs.

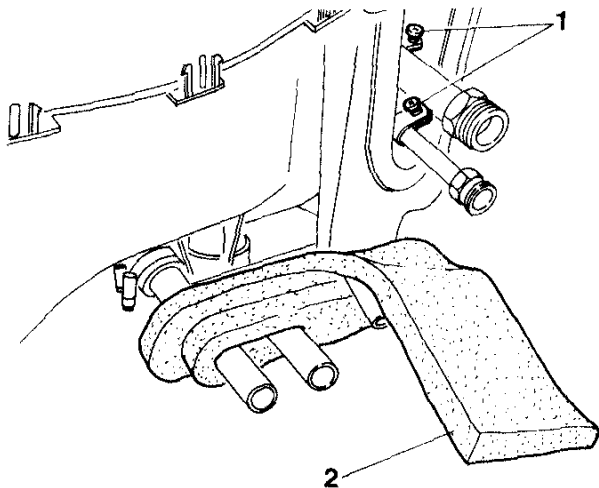


1. Loosen the screw securing the wiring.

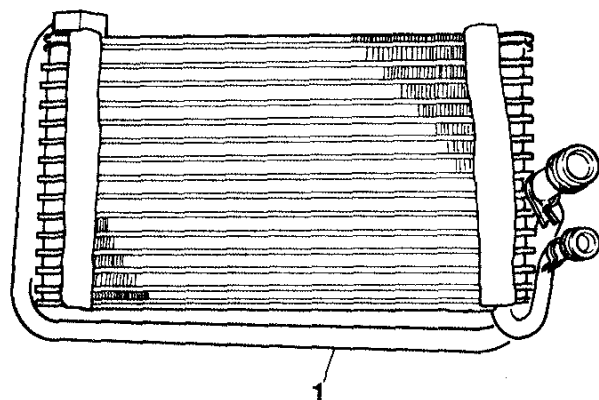




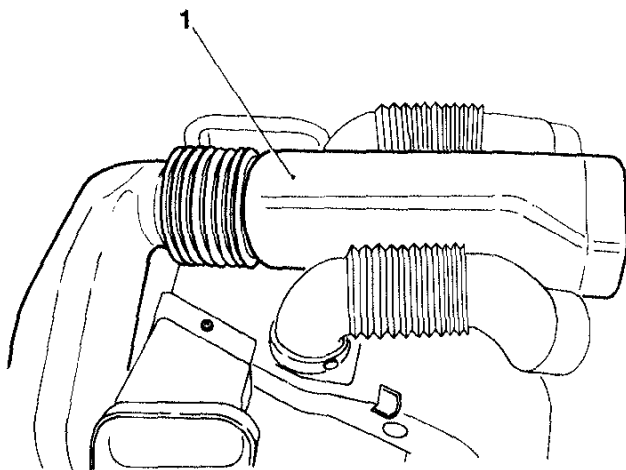
1. Loosen the screws on the clamps securing the inlet and outlet hoses carrying the Freon to and from the evaporator.
2. Remove the sponge protection.



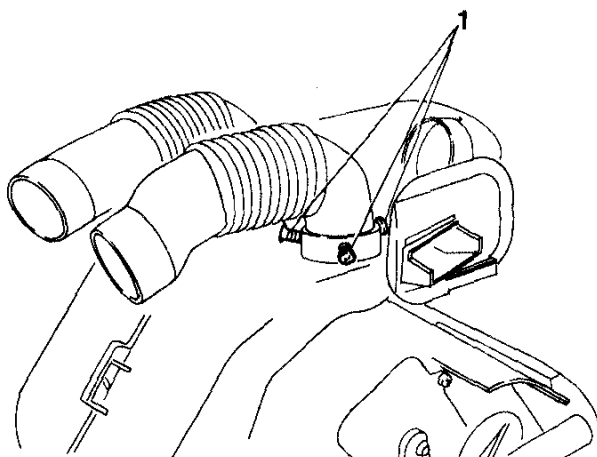
1. Remove the evaporator.



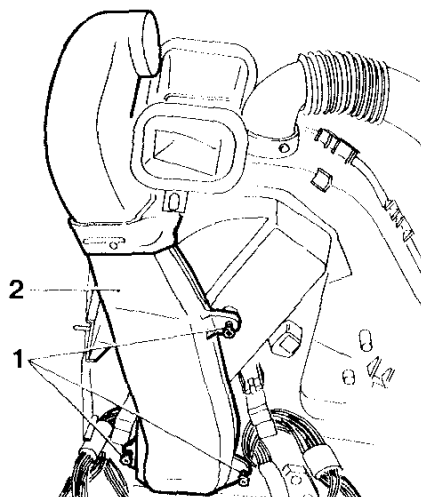
1. Disconnect the central tube carrying air to the tunnel outlets.



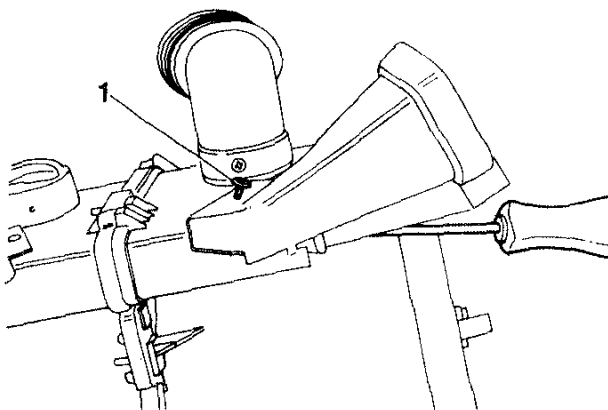
1. Loosen the screws (three for each outlet) and remove the side outlets.



1. Loosen the three screws securing upper part of the tube carrying air to the tunnel outlets.
2. Remove the tube.

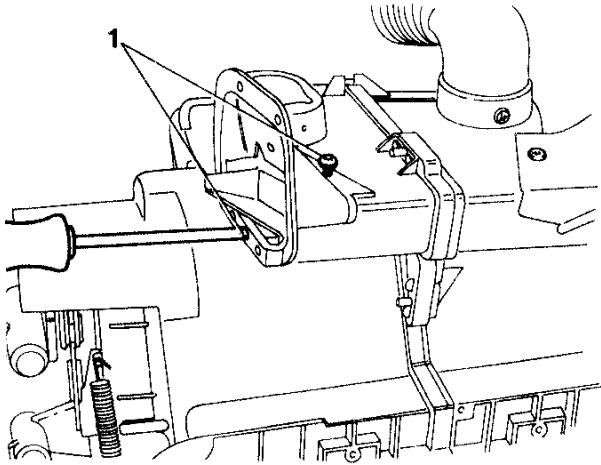


1. Loosen the two screws and remove the right-hand side outlet.

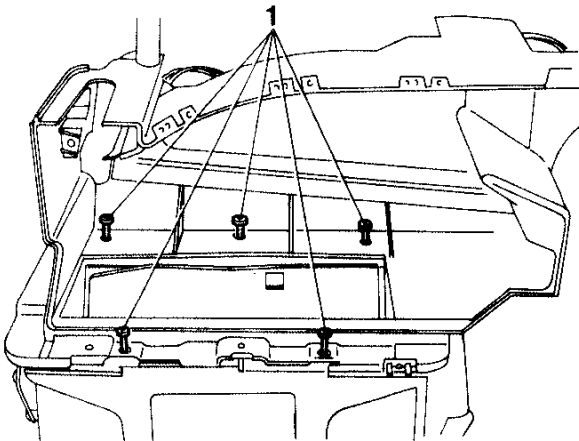




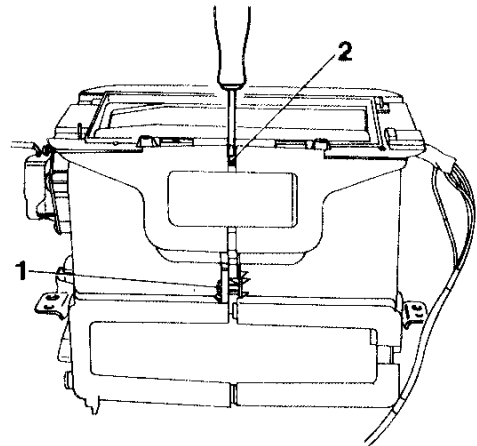
1. Loosen the two screws and remove the left-hand side outlet.



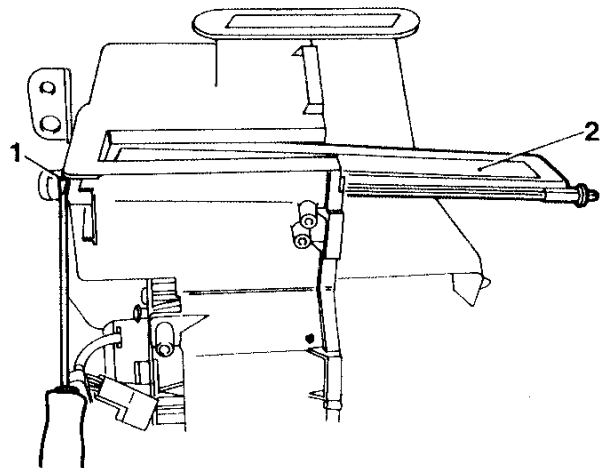
1. Loosen the five screws securing the lower part of the conveyor to the heating-distribution unit and remove the unit.



1. Loosen the screws securing the two heating-distribution unit casing halves.
2. Using a screwdriver as a lever, separate the two casing halves.



1. Using a screwdriver as a lever release the upper air distribution vent from the actuator levers.
2. Remove the upper air distribution vent.



Refitting



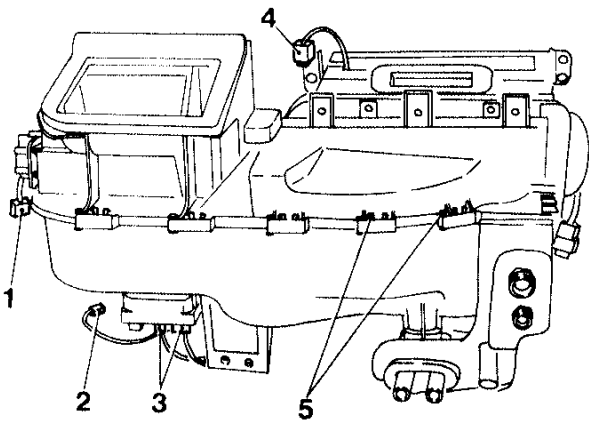
To refit, reverse the procedure followed for removal.



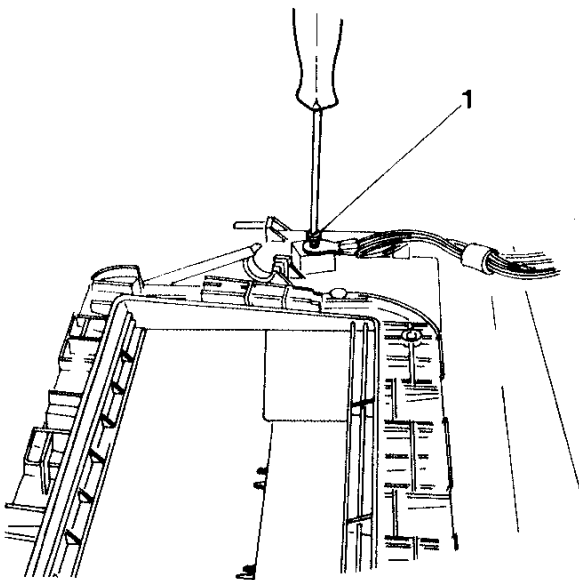
LOWER AIR DISTRIBUTION VENT

Removal

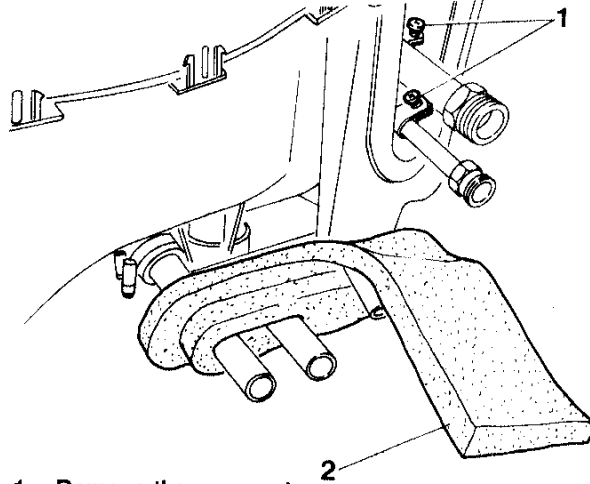
- First carry out the removal procedure given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
- 1. Disconnect the connector from the electric motor controlling the external and recirculation air flow regulation vent.
- 2. Disconnect the connector from the electric fan.
- 3. Disconnect the two connectors from the electronic fan-speed variator.
- 4. Disconnect the connector from the upper mixed air temperature sensor.
- 5. Loosen the screws (9 on the side and 3 on the front) securing the upper part of the conveyor and remove it using a thin-bladed screwdriver as a lever to disengage the tabs.



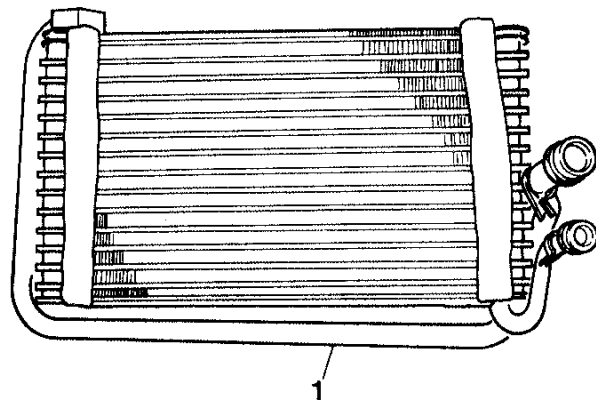
- 1. Remove the screw securing the wiring.



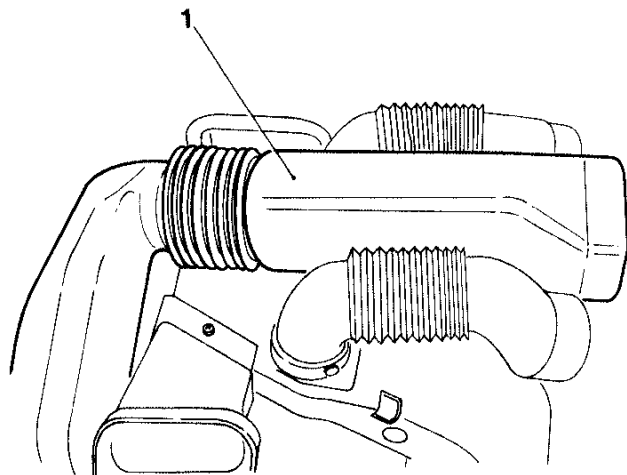
- 1. Loosen the screws on the clamps securing the inlet and outlet hoses carrying the Freon to and from the evaporator.
- 2. Remove the sponge protection.



- 1. Remove the evaporator.

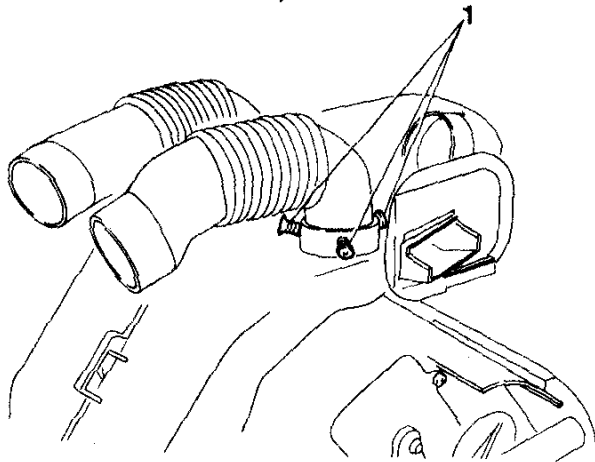


- 1. Disconnect the central tube carrying air to the tunnel outlets.

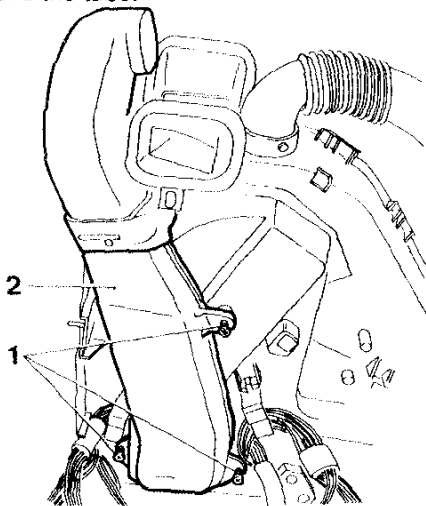




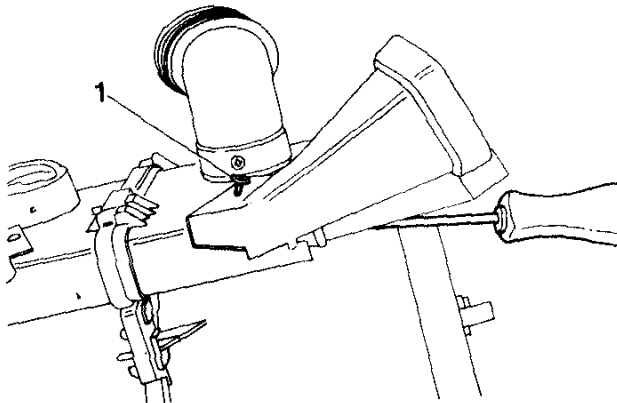
1. Loosen the screws and remove the side outlets (three for each outlet).



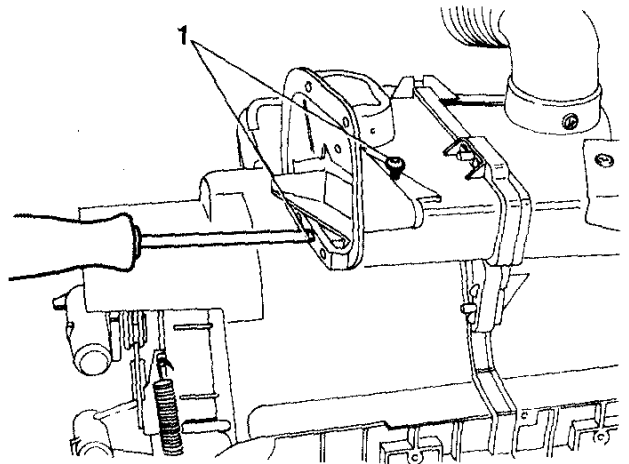
1. Loosen the three screws securing upper part of the tube carrying air to the tunnel outlets.
2. Remove the tube.



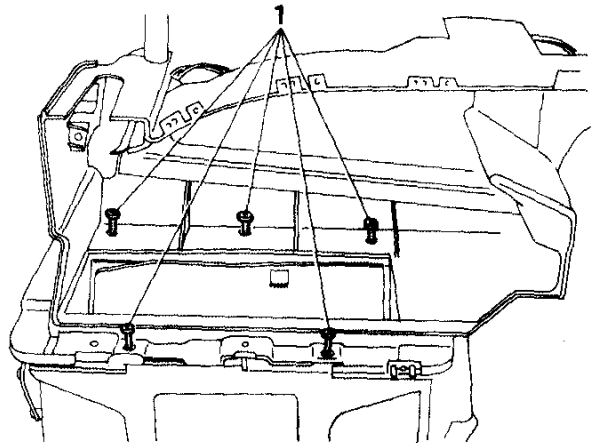
1. Loosen the two screws and remove the right-hand side outlet.



1. Loosen the two screws and remove the left-hand side outlet.

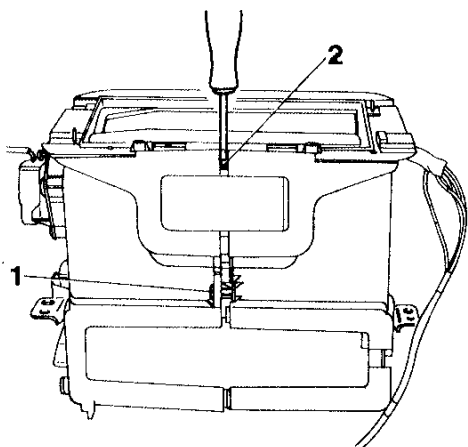


1. Loosen the five screws securing the lower part of the conveyor to the heating-distribution unit and remove the unit.

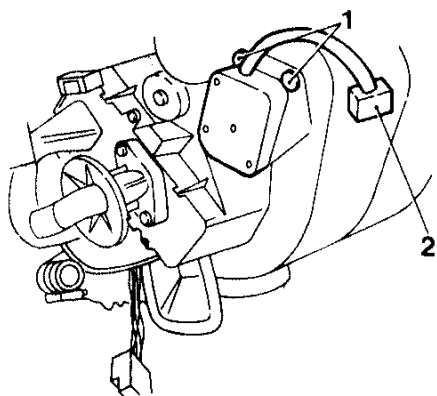




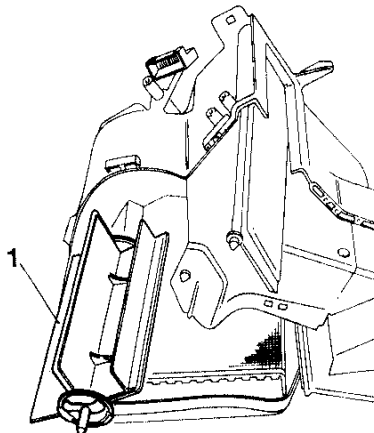
1. Loosen the screws securing the two heating-distribution unit casing halves.
2. Using a screwdriver as a lever separate the two casing halves.



1. Unscrew the screws securing the plate and actuator to the left-hand side wall of the heating-distribution unit.
2. Remove the actuator.



1. Remove the lower air distribution vent.



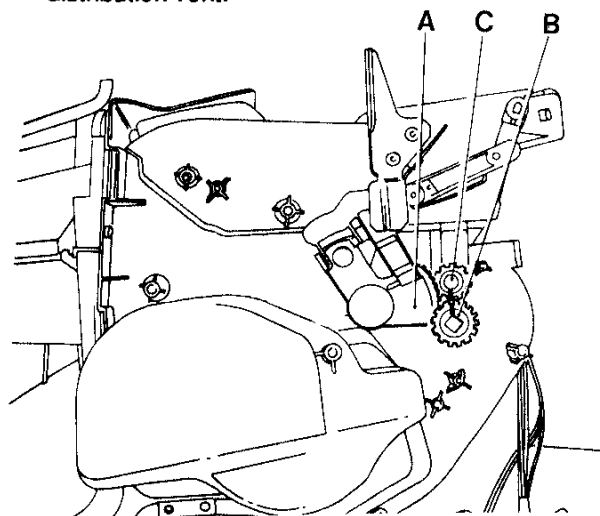
Refitting



To refit, reverse the procedure followed for removal.

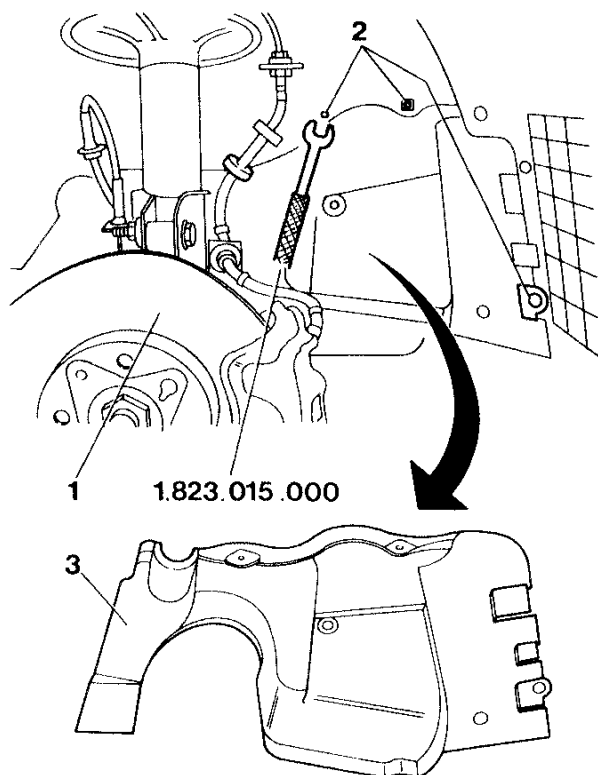
Supplementary Indications for refitting

- The gear (B), which forms a single unit with the lower air distribution vent, is orientated by the relative electric motor and orientates the toothed section (A) by means of an intermediate gear (C).
- When refitting the heating-distribution unit, the white raised part of the toothed section must be aligned with that of the intermediate gear and the second raised part of the intermediate gear must be aligned with that of the gear forming part of the lower air distribution vent.

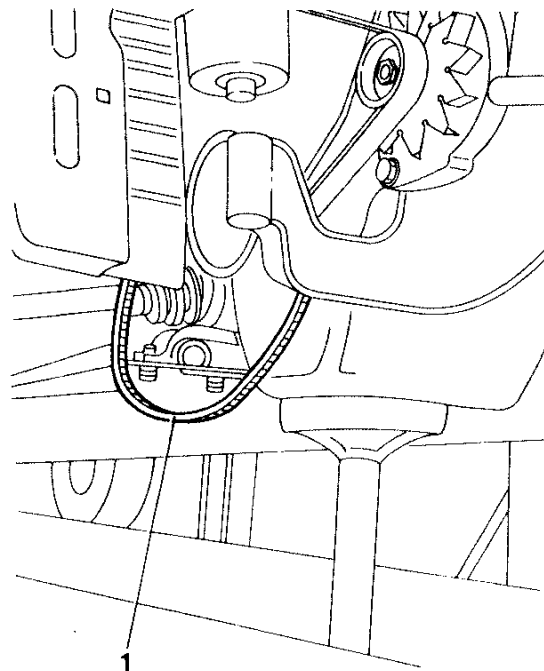


**COMPRESSOR (Model 1.8 - 2.0 TS)****Removal**

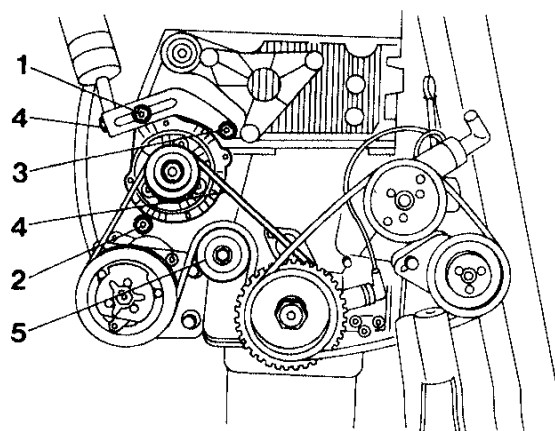
1. With the vehicle positioned on a lift, remove the front right- hand wheel.
2. Using tool No. 1.823.015.000 remove the plastic buttons securing the walling between the wheel arch and the engine compartment.
3. Remove the walling.



1. Remove the compressor drive belt.



1. Loosen the screw securing the alternator to the belt tensioner.
2. Loosen the screw securing the alternator to the lower support.
3. Loosen the screw securing the belt tensioner to the motor.
4. Adjust the belt tensioner regulation screw in order to pull out and remove the alternator and compressor drive belt.
5. Remove the pulley.





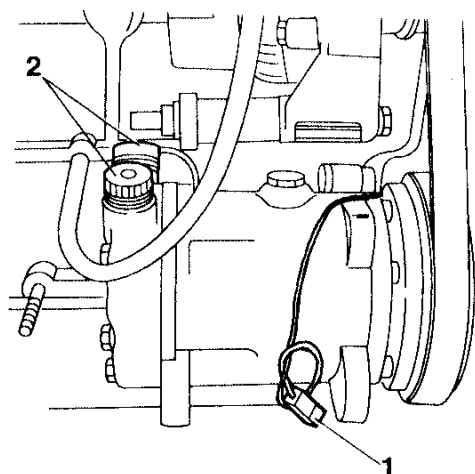
- Remove the forward section of the exhaust system (see REPAIR INSTRUCTIONS - ENGINE - GROUP 04).
- 1. Disconnect the cable connecting the solenoid to the compressor.
- 2. Disconnect the two Freon delivery and outlet hoses connected to the compressor.



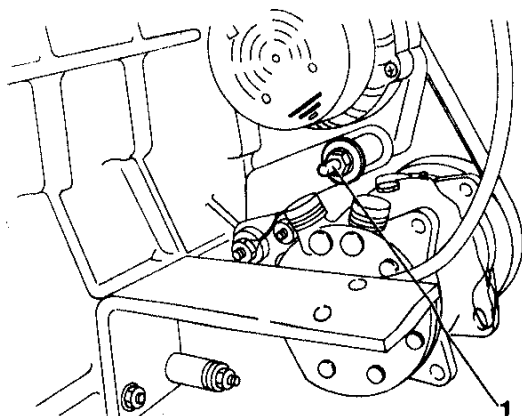
50 + 61 Nm
(5.1 + 6.2 kgm)



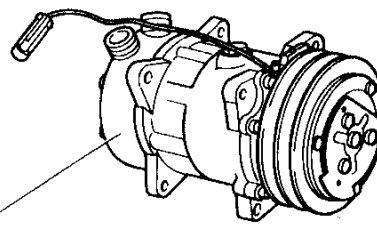
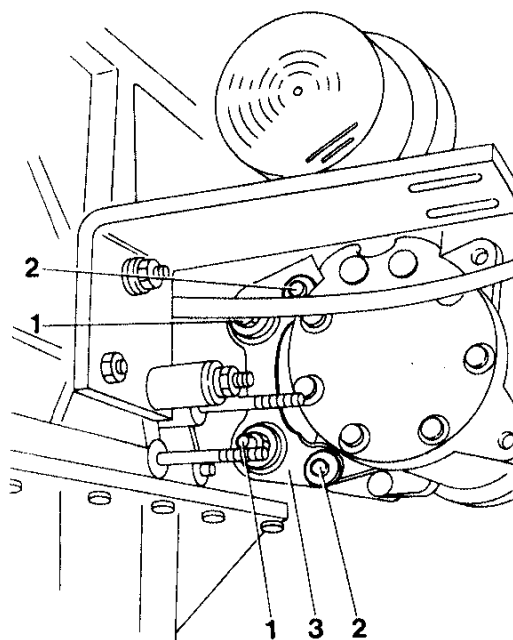
44 + 53 Nm
(4.5 + 5.4 kgm)



1. Partially remove the screw securing the lower bracket of the alternator support and raise the alternator as far as possible. Block the alternator in this position by tying to the engine with wire.



1. Loosen the screws on the brackets securing the compressor to the motor.
2. Partially remove the screws securing the compressor to the support.
3. Free the compressor from the bracket securing it to the motor. Support the motor with a hydraulic jack and slightly lower it in order to enable the compressor to be removed from underneath the vehicle.



Refitting



To refit, reverse the procedure followed for removal.

Supplementary indications regarding refitting

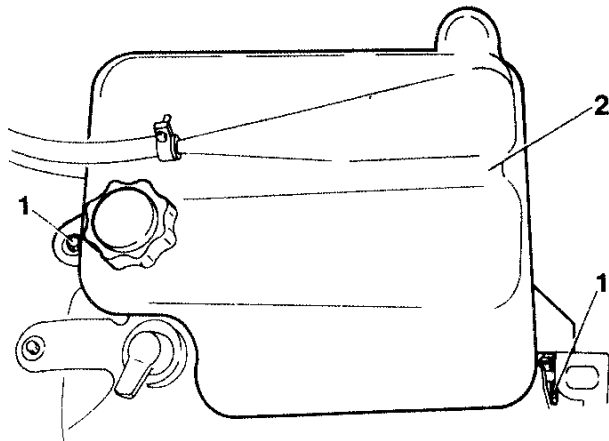
- Tighten the nuts and connections to the specified torque.



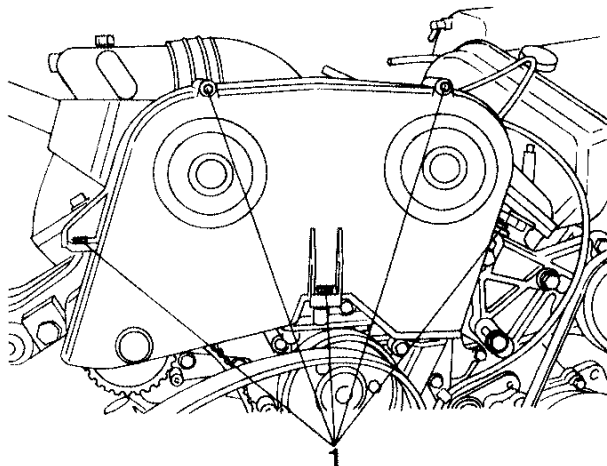
COMPRESSOR (Model 2.4 V6)

Removal

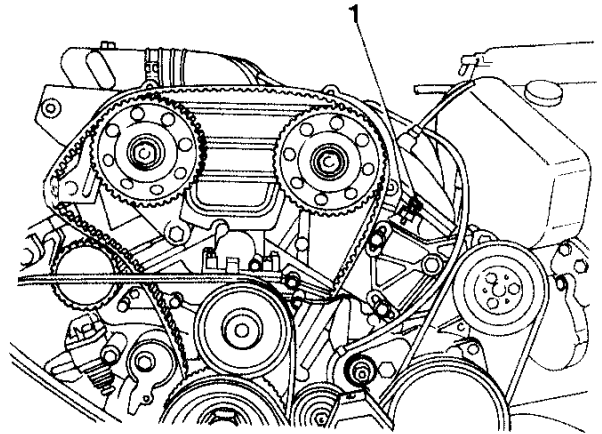
1. Loosen the screws securing the engine coolant reservoir.
2. Move the reservoir to one side.



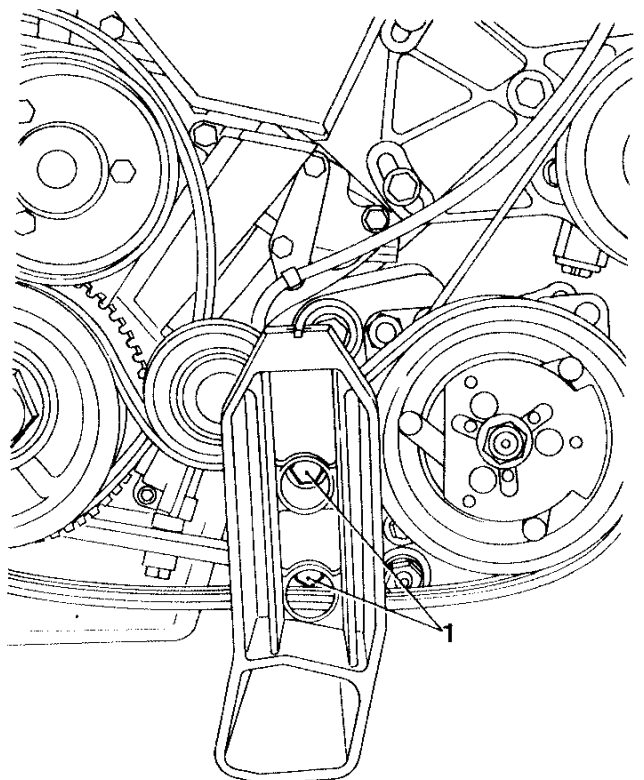
- Working under the timing belt cover, loosen the screws securing the power steering oil pump support to the engine block (see GROUP 23 "REPAIR INSTRUCTIONS - MECHANICAL ASSEMBLIES").
1. Unscrew and remove the screws securing the timing belt cover.



1. Loosen the regulation screw on the compressor-power steering oil pump belt tensioner support. Ensure that the compressor drive belt is free.

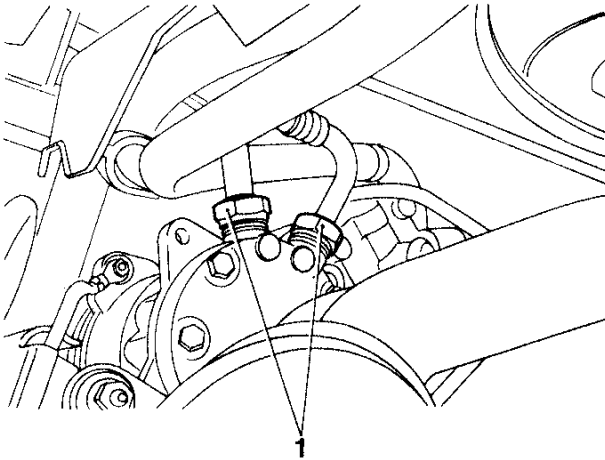


1. Raise the vehicle on a lift and loosen the two screws securing the compressor belt tensioner through the holes of the engine support.



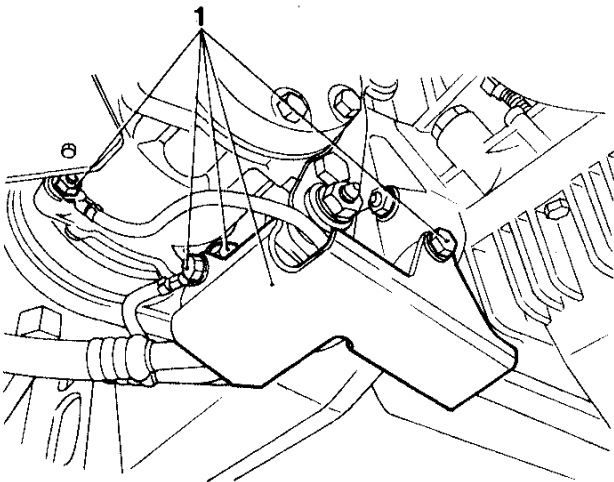


1. Remove the hoses carrying Freon to and from the compressor.

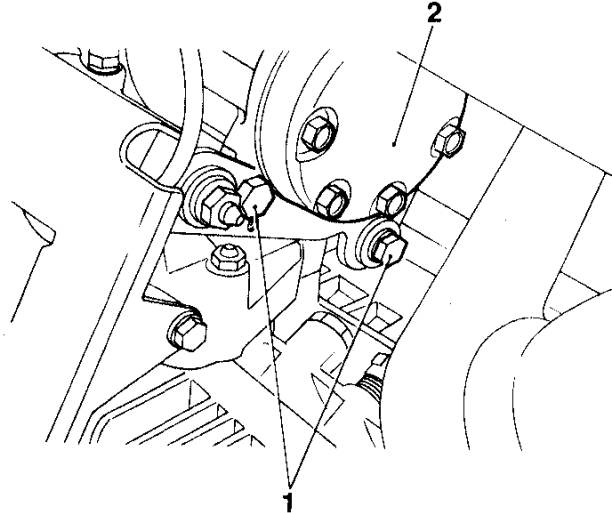


50 + 61 Nm
(5.1 + 6.2 kgm)

1. Disconnect the earth cables, loosen the screws on the protection bracket and remove the bracket. Disconnect the connector from the power supply cable.



1. Loosen the screws securing the compressor to its support.
2. Remove the compressor.



Refitting



To refit, reverse the procedure followed for removal.

Supplementary Indications regarding refitting

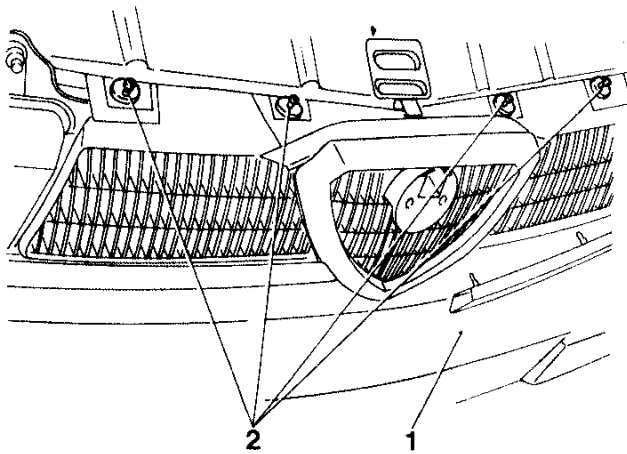
- When refitting tighten the nut to the correct torque.



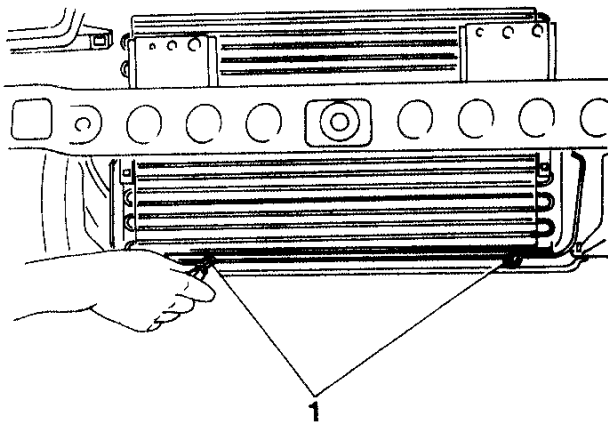
CONDENSER

Removal

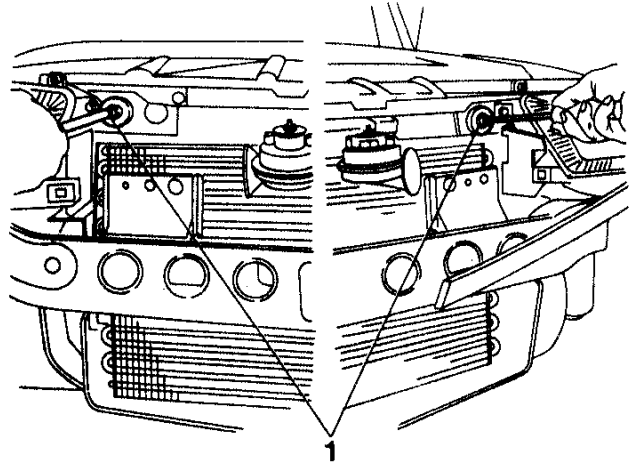
- With the vehicle on a lift, unscrew the two hoses carrying Freon to and from the condenser.
 - Loosen the lower screws securing the bumper to the chassis (see GROUP 75).
 - Loosen the upper screws securing the bumper to the chassis (see GROUP 75).
1. Remove the bumper.
 2. Loosen the screws securing the grill to the chassis.



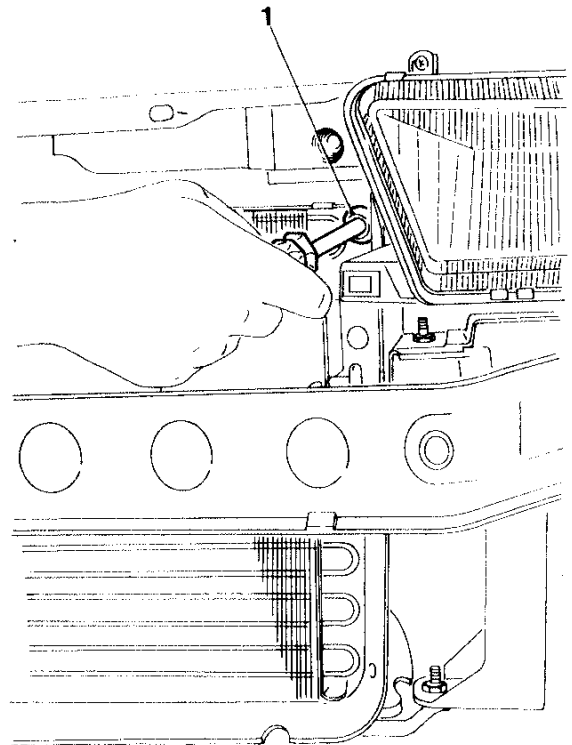
1. Loosen the two lower screws securing the condenser to the engine coolant radiator.



1. Loosen the two upper screws (complete with rubber washers) securing the radiator to the chassis.

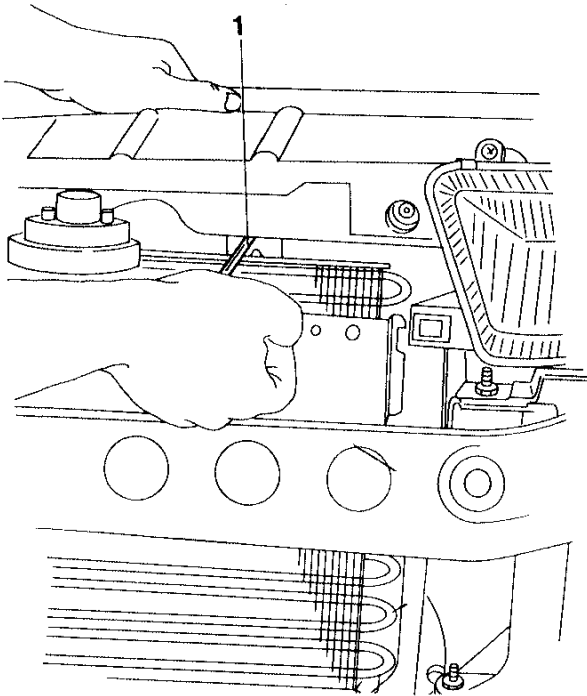


1. Loosen the screws securing the spacer to the radiator.

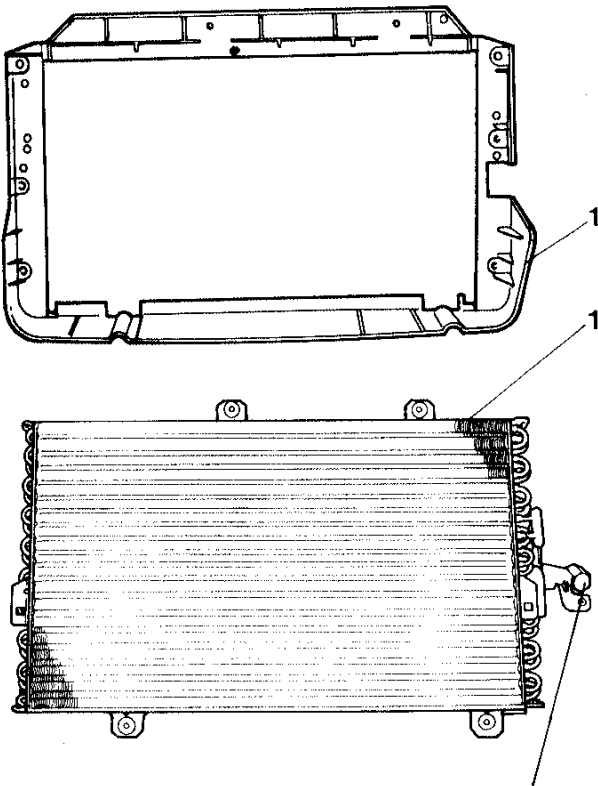




1. Loosen the upper screws securing the condenser to the radiator.



1. Remove the spacer and the condenser from the underside of the vehicle.



19 + 23 Nm
(1.9 + 2.3 kgm)

Refitting



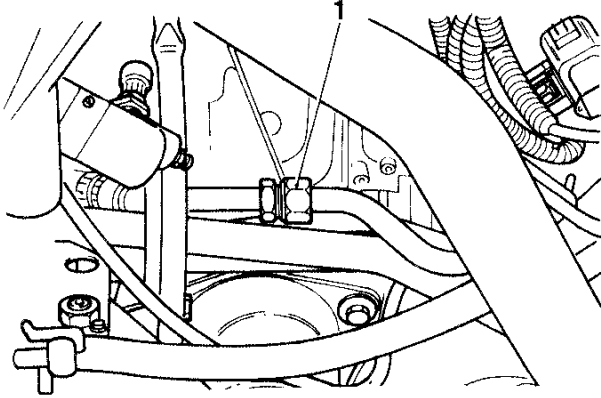
To refit, reverse the procedure followed for removal.

Supplementary Indications regarding refitting

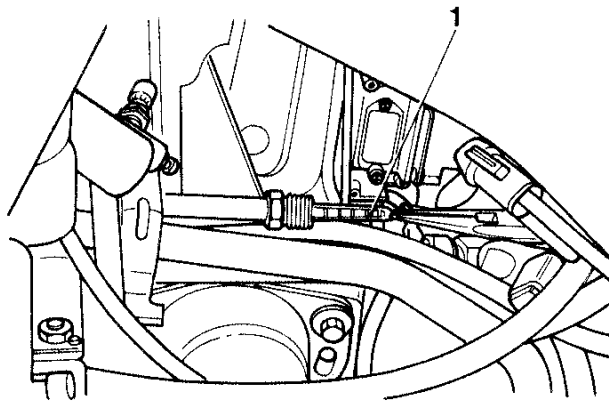
- Tighten the connections to the correct torque.

**EXPANSION VALVE****Removal**

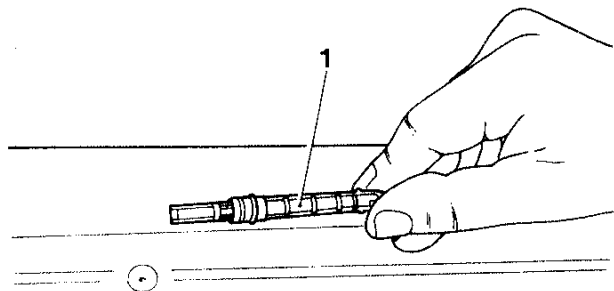
1. Working on the front part of the engine compartment unscrew the connection from the first stretch of hose connecting the condenser to the evaporator.



– The expansion valve is located inside this hose (1).



1. Withdraw the expansion valve.

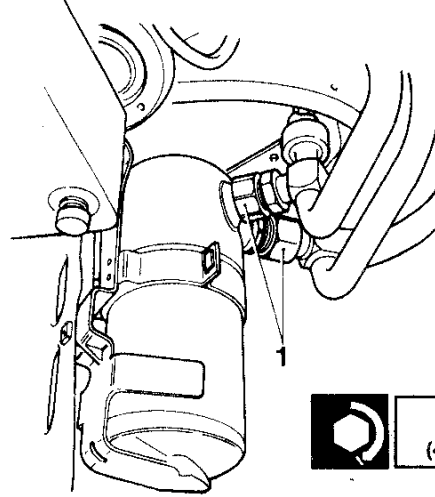
**Refitting**

To refit, reverse the procedure followed for removal.

PA4655D100000

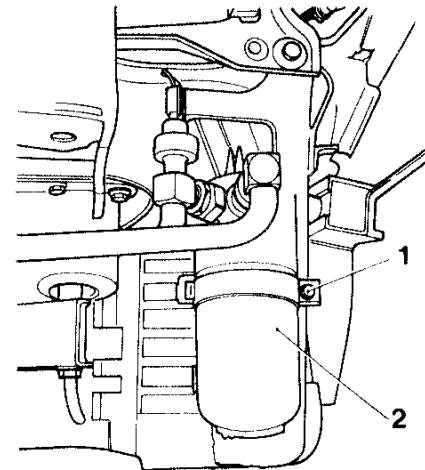
ACCUMULATOR-DEHYDRATOR**Removal**

1. Loosen the connections on the hoses connecting the accumulator-dehydrator to the evaporator and on the hose connected to the compressor.



44 + 53 Nm
(4.5 + 5.4 kgm)

1. Loosen screw connecting the two halves of the bracket securing the accumulator to the chassis.
2. Remove the accumulator.

**Refitting**

To refit, reverse the procedure followed for removal.

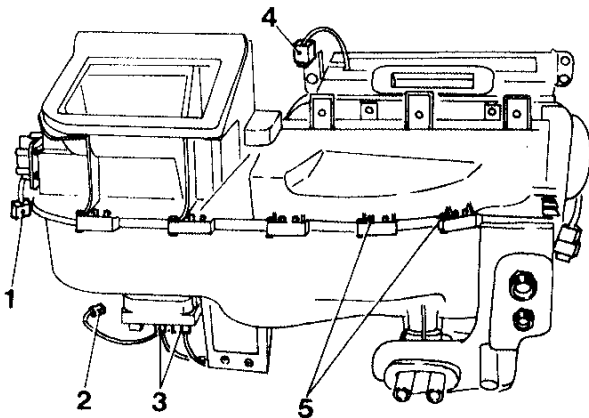
Supplementary indications regarding refitting

- Tighten the connections to the correct torque.

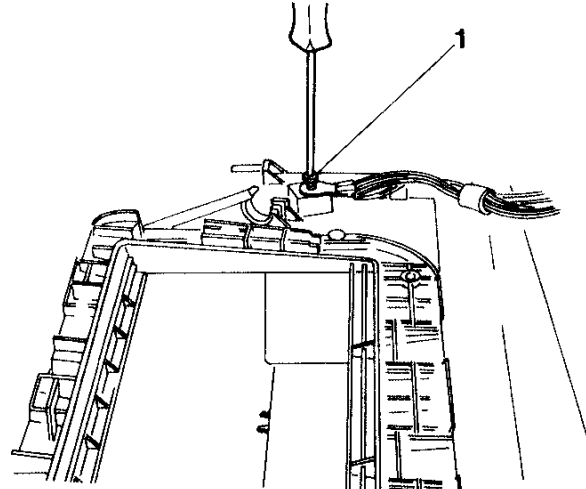
07 - 1991

**EVAPORATOR****Removal**

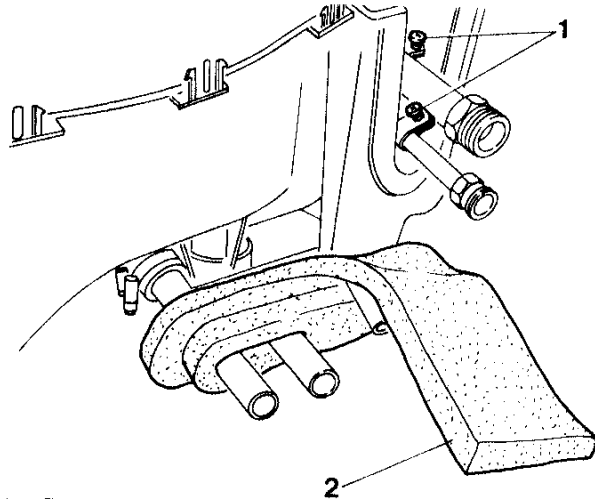
- First carry out the removal procedure given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
- 1. Detach the connector from the electric motor controlling the external and recirculation air regulation vent.
- 2. Disconnect the connector from the electric fan.
- 3. Disconnect the two connectors from the electric fan-speed variator.
- 4. Disconnect the connector from the upper mixed air temperature sensor.
- 5. Loosen the screws securing the upper part of the conveyor (9 on the side and 3 on the front) and, applying leverage with a thin-bladed screwdriver on the retaining tabs, remove the upper part of the conveyor.



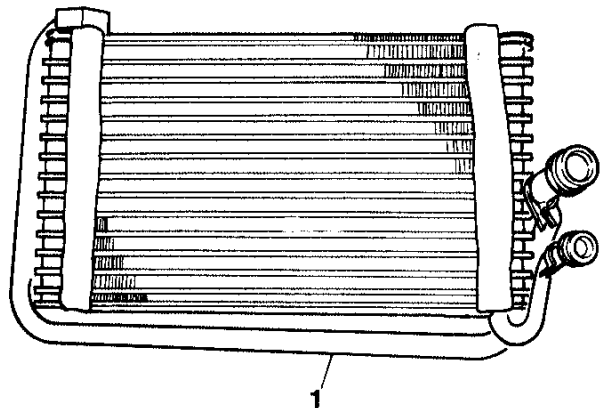
1. Loosen the screw securing the wiring.



1. Loosen the screws of the clamp securing the evaporator hoses.
2. Remove the sponge protection.



1. Remove the evaporator.

**Refitting**

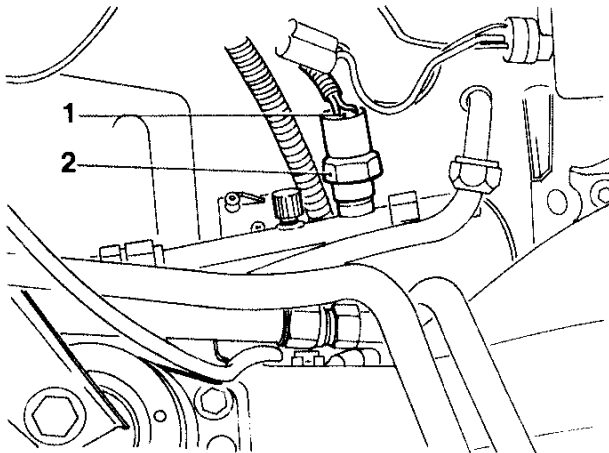
To refit, reverse the procedure followed for removal.



THREE-LEVEL PRESSURE SWITCH

Removal

1. Disconnect the electrical connection from the connection uniting the terminal cables of the three-level pressure switch.
2. Unscrew the pressure switch from the hose.



Refitting

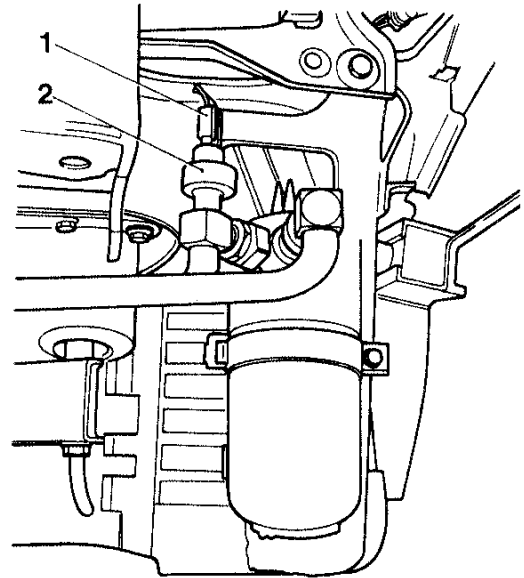


To refit, reverse the procedure followed for removal.

DEFROSTER PRESSURE SWITCH

Removal

1. Disconnect the electrical connection from the pressure switch.
2. Unscrew the pressure switch from the hose.



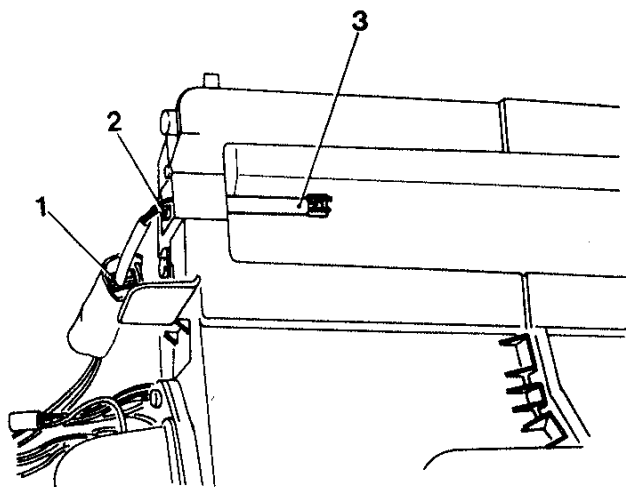
Refitting



To refit, reverse the procedure followed for removal.

**UPPER MIXED AIR TEMPERATURE SENSOR****Removal**

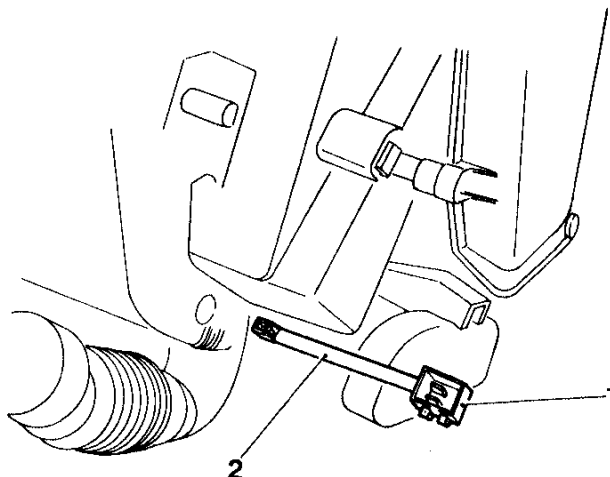
- First carry out the removal procedure given in the paragraph "CONVEYOR ASSEMBLY AND HEATING-DISTRIBUTION UNIT - Removal".
- 1. Disconnect the electrical connector.
- 2. Loosen the screw securing the heating-distribution unit.
- 3. Remove the sensor.

**Refitting**

To refit, reverse the procedure followed for removal.

LOWER MIXED AIR TEMPERATURE SENSOR**Removal**

- Remove the dashboard skirt (see GROUP 66).
- 1. Disconnect the electrical connector.
- 2. Using a thin-bladed screw driver as a lever, remove the sensor.

**Refitting**

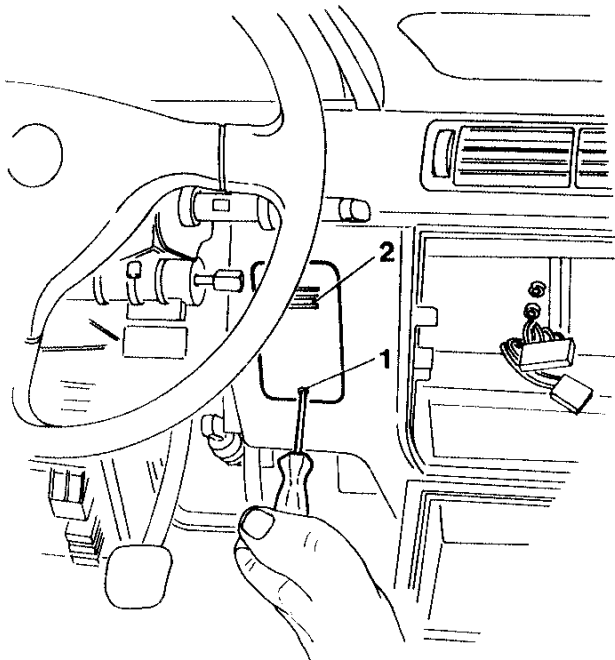
To refit, reverse the procedure followed for removal.



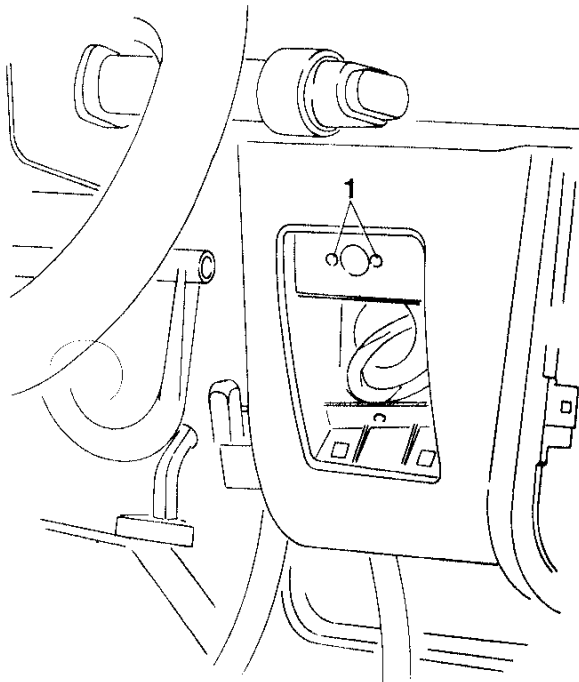
PASSENGER COMPARTMENT AIR TEMPERATURE SENSOR

Removal

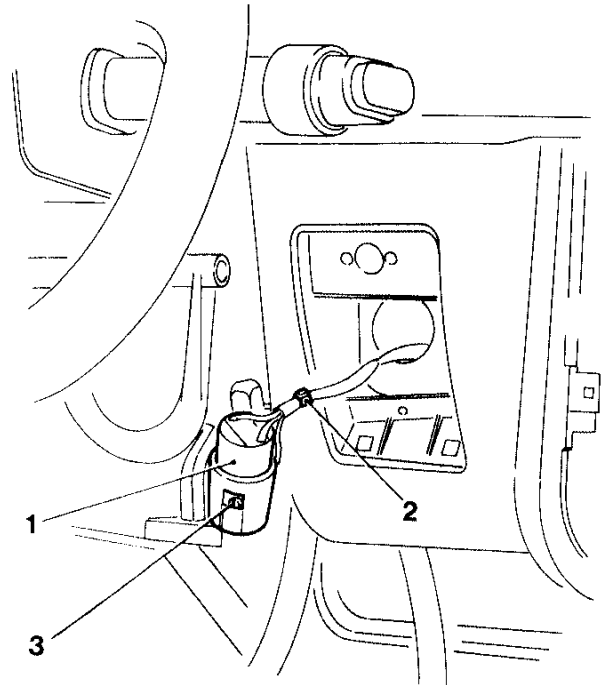
1. Loosen the screw securing the passenger compartment air temperature sensor cover.
2. Using a thin-bladed screwdriver as a lever remove the cover from its seating.



1. Loosen the screw securing the sensor.



1. Withdraw the sensor from inside.
2. Disconnect the connecting cables.
3. Remove the sensor.



Refitting



To refit, reverse the procedure followed for removal.

EXTERNAL AIR TEMPERATURE SENSOR

- This sensor forms an integral part of the left-hand door mirror. If the sensor is found to be faulty it is necessary to replace the entire assembly (see GROUP 40).



DISCHARGING THE REFRIGERANT



CAUTION

The safety rules given in the introduction to the maintenance instructions should be observed at all times.

Freon is not a dangerous product but it can become toxic in the presence of naked flame. For this reason it is advisable to drain the Freon circuit away from flames and if possible, in a ventilated area.

Avoid exposing the skin to evaporating Freon for long periods. The gas being discharged at environmental temperature and pressure expands rapidly reaching temperatures of $-29.8\text{ }^{\circ}\text{C}$ ($-21.7\text{ }^{\circ}\text{F}$) and may cause "burning" due to the excessively low temperature.

Protect the eyes from contact with the refrigerant as the excessive and instant low temperature may cause serious injury.

1. Unscrew and remove the cap from the valve on the low pressure hose.

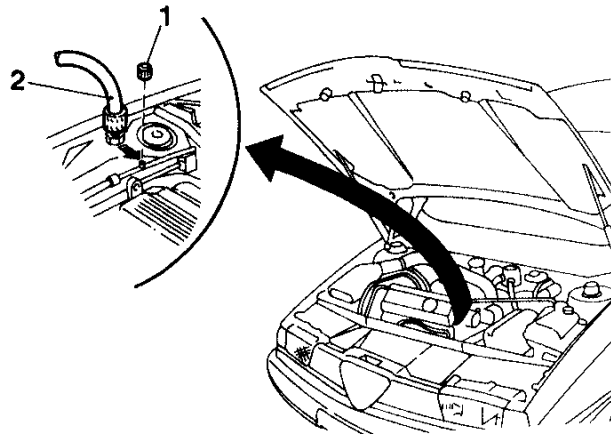


CAUTION

Discharging Freon into the atmosphere is harmful to the environment.

Collect the Freon in a specific collection system.

2. Attach the special tube (fitted with a needle connection) to the valve and discharge the system (RESPECTING THE CURRENT LAWS).



REFILLING THE SYSTEM WITH REFRIGERANT



CAUTION

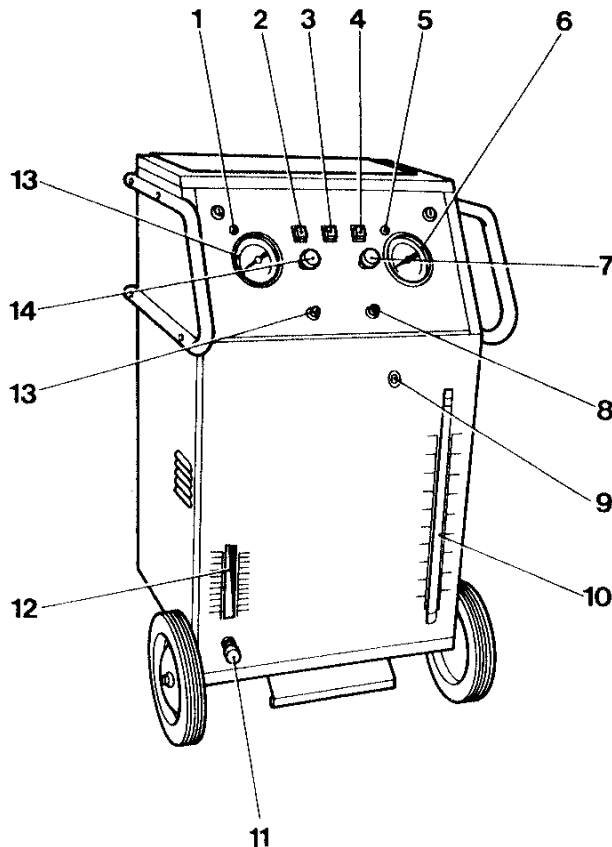
The safety rules given in the introduction to the maintenance operations should be followed at all times. The following should be particularly noted:

Freon is not harmful to either vehicles or people, however, as it is stored under pressure it is susceptible to physical transformation which can render it dangerous if not correctly handled. For this reason it is vital that the information given below is followed at all times. The fluid is normally stored in metal cylinders. Never expose the cylinders to the sun for extended periods as the temperature will cause an increase in pressure which could exceed the safety limits.

The transvasing of the metal cylinder to the loading station during cold weather may prove difficult due to the low pressure in the cylinder. In this situation leave the cylinder to stand in a heated area, not above $35\text{ }^{\circ}\text{C}$ ($95\text{ }^{\circ}\text{F}$), for about twenty minutes. Never heat the cylinder using a naked flame. Never leave the cylinder of the loading station completely full for long periods.



**APPARATUS FOR DISCHARGING-REFILLING
FREON
(DAVIA GREEN REFMATIC TYPE LOADING
STATION)**



1. Cylinder temperature warning lamp
2. Ignition
3. Automatic oil discharge
4. Pump control
5. Cylinder full warning lamp
6. Cylinder pressure gauge (empty)
7. Tap for outlet connection
8. Outlet connection
9. Humidity indicator
10. Recuperated oil gauge
11. Oil drainage tap
12. Drained oil indicator
13. Input connection
14. Tap for input connection
15. Input pressure gauge



CAUTION

Read all the procedures given below before using the loading station.

SAFETY RULES

1. The loading station must be used in a ventilated area with at least four changes of air every hour. Avoid inhaling the coolant vapours as they are dangerous and may also be lethal.
2. Do not use the loading station near inflammable materials or open or leaking containers.
3. Never open the outlet tap if the corresponding connection has not been attached to the specific tube, a service valve of an A/C system or a container homologated for containing R-12. If the level of coolant in the station's storage cylinder falls below the zero mark on the scale a solenoid valve will close the outlet to prevent the passage of air. If the outlet tap is left open without being connected to a suitable container via the specified tube when the warning lamp is on and the level in the cylinder is above the zero mark, high pressure refrigerant will be discharged to the atmosphere. The solenoid valve controlling outlet is closed automatically when the loading station is deactivated or the temperature of the refrigerant in the cylinder is below 50 °C when the loading station is used even if the heaters are activated. When the R-12 reaches 50 °C the solenoid valve opens automatically.
4. The loading station has been designed for use with R-12. Do not use with any other refrigerating product.
5. Do not tamper with or attempt to modify the calibration of the breather and safety valves.



6. If it is necessary to replace a fuse always use fuses of the same type and never greater than 1 Amp (system protection).
7. Never leave the loading station activated (red button in the ON position) if it is not to be used. Always remove the connection to the mains when the workshop is left unattended.
8. Do not fill any cylinder, A/C loading apparatus or container with R-12 unless it has been homologated to a pressure of at least 35 bars and has been equipped with a suitable safety valve. Do not transfer R-12 into containers which are not suitable for refilling.
9. Do not fill any container to more than 80% of its total capacity.
10. Always use the original power supply cable. If this gets broken or damaged replace it with another with identical characteristics. When an extension lead is necessary it must be homologated to 10A 220 V and be as short as possible to avoid the possibility of overheating and short-circuiting.

Preparation of the loading station

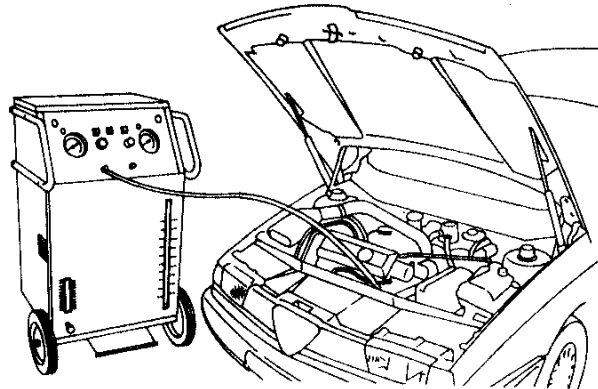
Perform the following operations:

- A. Installing power socket
- B. Installing filters
- C. Checking performance and checking for leaks.

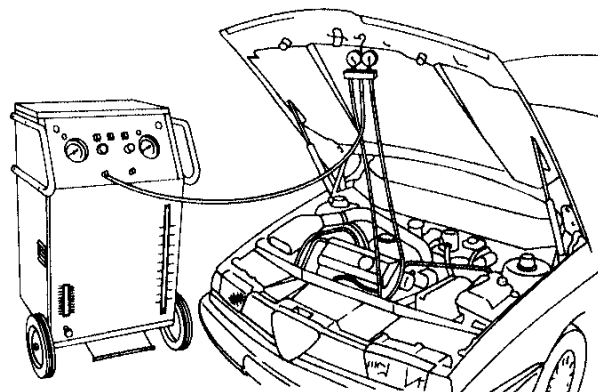
Use of a loading station for the recovery of R-12 from an A/C system

1. To get the best results and reduce the recovery time, start the engine of the vehicle and run the air conditioning system for a few minutes. Switch off the engine.
2. During the recovery operation the vehicle and the A/C system must always be switched off.

3. Check that the inlet and outlet taps on the loading station are completely closed. Activate the loading station (red button to the the ON position).
4. Connect one end of the blue hose (using the connection without a valve) to the inlet connection on the loading station.
5. Connect the other end (with valve) of the blue hose to the A/C system on the vehicle.
This connection can be made in one of three ways:
A. Connecting the blue hose directly to the service valve on the high pressure section of the A/C system.



- B. Connecting a tap unit by suitable hoses to the high pressure service valve and the low pressure service valve and connecting the blue hose on the loading station to the central connection on the tap unit.





Open all the taps necessary to drain the A/C system.

At this point the operator must check the indicator on the oil collection cylinder and note the initial level and do the same with the level of coolant in the cylinder.

6. Open the inlet tap on the loading station and the taps on the tap unit (if used).

As the R-12 discharged by the A/C system enters the inlet connection, the inlet pressure indicated by the pressure gauge located on the left-hand side of the control panel will increase.

When this pressure reaches 0.3 bars an acoustic signal will sound and when the pressure reaches 1 bar the suction pump inside the loading station will start.

7. Push the green button to the ON position.

This will stop the acoustic signal and facilitate the automatic separation of the oil in the R-12 discharged by the A/C system.

The R-12 in the A/C system will continue to be transferred to the control unit until the input pressure has decreased to -0.2 bars. At this point the input solenoid valve closes, the pump stops, the oil is automatically drained into the relative collection tank and an intermittent acoustic signal will sound.

NOTE: If the level of R-12 in the collection cylinder reaches values around 4.5 Kg, the red warning lamp indicating "CYLINDER FULL" will come on and the input solenoid valve will close preventing the entry of more refrigerant from the relative connection. After the solenoid valve has closed the input pressure falls to -0.2 bars, the pump stops and an acoustic signal sounds.

To be able to continue the recovery operation it is necessary to close the Inlet tap and transfer an adequate amount of R-12 to another cylinder.

See paragraph "What to do when the "cylinder full" warning lamp comes on.

8. Close the inlet tap

9. Push the green button to the OFF position to stop the acoustic signal.

10. Determine the quantity of oil drained from the A/C system by noting the difference between the final level and the initial level in the recovery cylinder.

NOTE: The modest quantity of R-12 remaining in the A/C system is in the form of a very cold vapour and also in liquid form which is even colder (approx. -30°C). This R-12 has a very low pressure which slows down the recovery process. It is necessary to wait for at least 5 minutes so that the heat absorbed by the engine compartment boils the residual liquid R-12 and increases the pressure.

The pressure readings on separate pressure gauges may be of use in checking for the boiling rate of the remaining R-12.

When the pressures inside the A/C reach values between about 1.4 and 2 bars, no liquid R-12 should be left in the system. The operator can then proceed to the next step, indicated in paragraph 11.

11. The operator must wait until the remaining liquid R-12 (see previous note) has evaporated so that it can be collected by opening the inlet tap and pressing the red button to the ON position.

When the button is pressed the loading station pump is activated.

When the pressure falls below -0.2 bars an acoustic signal alerts the operator.

12. Push the red button to the OFF position to switch off the acoustic signal.

With this the recovery operations are terminated and the inlet tap can be closed.

NOTE: The operator must wait for at least five minutes after the pressure in the A/C system falls below "0" bars in order to ensure that no liquid R-12 or saturated vapour is left in the system.



If the pressure rises above zero, press the pink button to the ON position to activate the pump until a stable minimum degree of vacuum is reached (-0.2 bars).

**CAUTION**

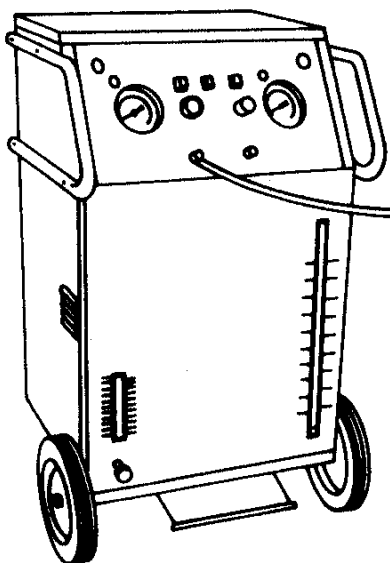
To protect the environment 100% of the R-12 must be recovered.

13. When the loading station is finished with it is necessary to:

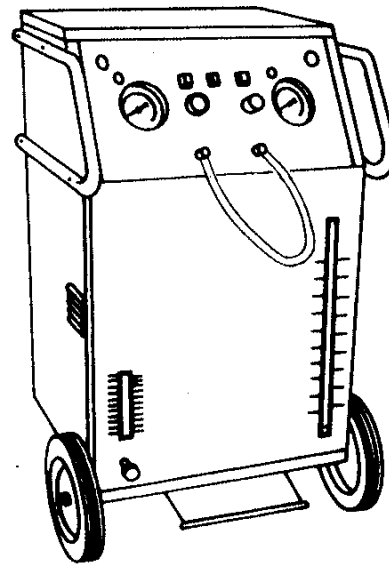
- A. Recover any R-12 left in the blue hose connected to the inlet connection by opening the inlet tap and pressing the pink button to the ON position. The pressure falls to -0.2 bars and an acoustic signal is activated.

Close the inlet tap and push the pink button to the OFF position.

Disconnect the blue hose.



- B. Ensure that the outlet tap on the loading station is closed. Recover any R-12 left in the red hose connected to the outlet connection. This is done by connecting the other end of the red hose to the inlet connection, opening the relative tap and pressing the pink button to the ON position.



When the acoustic signal is activated the hose is empty. Press the pink button to the OFF position to turn off the acoustic signal and stop the pump. Close the inlet tap and disconnect the hose from the two connections.

- C. Switch off the loading station by pressing the red button.

- D. Disconnect the supply cable.

What to do when the "cylinder full" warning lamp comes on

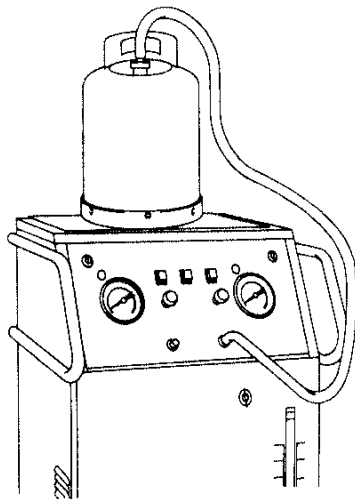
If the level of R-12 in the recovery cylinder reaches approximately 4.5 Kg, the red "CYLINDER FULL" warning lamp comes on and the input solenoid valve closes preventing further R-12 from entering.

After the solenoid valve has closed the inlet pressure decreases to - 0.2 bars, the pump stops and the acoustic signal is activated.



1. Close the inlet tap and press the green button the the OFF position to stop the acoustic signal.
2. Connect the red hose (using the connector without a valve) to the outlet connection of the loading station.

Connect the other end (with valve) to an adequate container (loading cylinder, homologated container etc.).



3. Open the outlet tap on the loading station and the corresponding tap on the container (see "Transfer of refrigerant" - point 2 and also points 3 and 10 of the "safety rules"). Transfer an adequate quantity of R-12 and close the outlet tap.
4. Open the inlet tap and press the green button in order to continue the recovery process of the coolant.

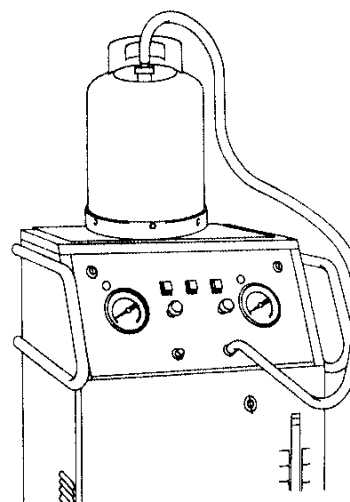
Transfer of refrigerant



CAUTION

Read the safety rules before continuing.

1. Ensure that the inlet and outlet taps on the loading station are closed.
2. Switch on the loading station by pressing the red button and wait until the red cylinder temperature button comes on (see NOTE B below).
3. Before transferring the refrigerant into another container it is necessary for this container to contain a vacuum of at least -0.1 bars.
4. Connect the red hose on the outlet connection on the loading station to the connection on the container.



5. Open the outlet tap on the loading station and the tap on the container. Transfer the desired quantity of R-12. Close the outlet tap on the loading station and the tap on the container before disconnecting the red hose from the container.



NOTE A: The pressure in the storage container on the loading station (indicated by the right-hand pressure gauge on the control panel) must be higher than that of the receiving container in order to permit R-12 to be transferred, otherwise reduce the pressure in the container causing the venting through the inlet connection on the loading station.

NOTE B: Before the coolant can be transferred from the loading station to another container, it is necessary for the temperature in the storage cylinder to have reached at least 50°C: This is one of the conditions which make it possible to remove air and other gasses which cannot be condensed from the R-12 in the cylinder. If the temperature is below 50°C, the red warning lamp on the control panel will not go out and the outlet solenoid valve will stay closed preventing the transfer of the refrigerant.

The cylinder heating system is only activated when the loading station is switched on (red button to the ON position).

The transfer is also prevented when the level of the liquid refrigerant in the cylinder is below zero on the gauge (see "safety rules" - point 5). To permit the loading station to operate correctly and continuously the residual quantity of liquid, visible on the gauge on the cylinder, must not be removed.

REFILLING AN A/C SYSTEM

NOTE: Connect the system to the socket and activate it (red button in the ON position) in order to heat the coolant in the cylinder until the temperature warning lamp comes on. Depending on the quantity of coolant in the cylinder and its temperature the time necessary may vary from 10 to 20 minutes.

1. After diagnosis, the recovery of R-12, repair and refilling of the compressor with oil and the creation of a vacuum in the A/C system, connect the red hose to the outlet connection on the loading station.
2. First of all remove the air inside the red hose by connecting the end (with the valve) to the inlet connection on the loading station, open the relative tap and slowly open the outlet tap for a few seconds. In this way the air in the hose is sucked through by the loading station preventing the dispersion of R-12 into the atmosphere.
Disconnect the hose from the inlet connection.
3. Connect the red hose to the service valve on the high pressure side of the A/C system or to the central connection of the tap unit if used. In this case connect the red hose (leaving the unit) to the high pressure service valve on the A/C system and open the corresponding tap.



CAUTION

The vehicle engine must be switched off and the A/C system deactivated.

4. Check that the quantity of coolant in the cylinder on the loading station is enough to refill the A/C system. If not, add more coolant through the inlet hose. The level of the coolant in the cylinder must not fall below the zero mark.
5. Check the level of the fluid in the cylinder, remove the quantity required to fill the system and set the indicator.
6. Open the outlet tap and continuously monitor the level. When this reaches the level indicated by the indicator positioned previously, press the red button to the OFF position.



NOTE: The loading station can discharge up to 1.5 kg/1'.

7. Close the tap on the tap unit (if used) and disconnect it from the A/C system.
8. If the loading station is to be re-used, press the red button again so that it is in the ON position.

NOTE: The loading station will not permit a high vacuum to be obtained and if this is required, a suitable pump must be used.

The pressure gauges on the loading station indicate the pressure inside the loading station and not that of the A/C system. To be able to obtain this information it is necessary to use a supplementary pressure gauge.

**SYSTEM DIAGNOSIS**

The system in question may be affected by three types of anomaly:
mechanical (noise);

electrical (inefficient cables or other parts (see ELECTRICAL MANUAL);
functional (deriving from the previous points or intrinsic to the parts forming the system).

| MECHANICAL PROBLEMS | | |
|---|---|--------|
| Fault | Possible cause | Remedy |
| Noisy compressor | Compressor pulley not perfectly aligned with that machined onto the crankshaft. | A |
| | Compressor belt under abnormal operating conditions (slack or too tight) or worn. | B |
| | Knocking of compressor due to excessive FREON or for the presence of incondensable gas in system. | C |
| | Loose screws and bolts securing the the compressor to the engine. | D |
| | Pulley with noisy electromagnetic joint. | E |
| | Compressor knocking due to internal play or due to tendency to seize. | F |
| Noise from assembly located under dashboard | Noise from the brushes of the heating-ventilation system electric fan motor | G |

- A. Check the installation and the attachment of the pulleys.
- B. When the belt is flexed it must be 1 cm under a load of 9.8 + 14.7 daN (10 + 15 kg). When the belt is new, run the engine for a few minutes before adjusting.
- C. Discharge, dehydrate and refill the system.

- D. Check and tighten all screws and bolts.
- E. If the noise continues after the torque of the nut securing the clutch plate has been checked disconnect the compressor and replace the faulty part (bearing, safety ring, pulley, clutch plate).
- F. Discharge the system and replace the compressor.
- G. Replace the electric fan.

**FUNCTIONAL PROBLEMS**

To establish the probable causes and rectify the problems it is necessary to carry out the following operations:

- before connecting the control apparatus, the vacuum and the refilling the system, check that all the taps are closed;
- open the high and low pressure taps and the tap excluding the metering cylinder, in order to expel the air in the flexible hoses on the vehicle;
- close all the taps;
- connect the hose on the low pressure side to one of the needle valves welded to the hose connecting the accumulator-dehydrator to the compressor or evaporator;
- connect the hose on the high pressure side to the needle valve welded to the first stretch of the hose connecting the condenser to the evaporator next to the three-level pressure switch;
- check the high and low pressure readings on the pressure gauges.

| MEASURED PRESSURE | CAUSE OF MALFUNCTION | CORRECTIVE PROCEDURE |
|--------------------------------|--|---|
| A value between 0 + 0,7 bar | System drained (or almost) due to leak. | Add 400 grams of FREON 12 to the system and find and eliminate leaks. |
| A value between 0,7 + 1,65 bar | System almost drained due to leaks. | Locate and eliminate the leaks (*). |
| A value above 2,5 bar | When the heating-ventilation system is on the electromagnetic coupling of the compressor pulley does not work. | After controlling the power supply circuit of the electromagnetic coupling of the compressor pulley substitute the three-level pressure switch. |

(*) Before operating bear in mind that the pressure value indicated refers to an external temperature above 10° C.



When the external temperature is above 10 ° C start the engine and run it at 1000 r.p.m..

Press the AUTO button engaging the heating-ventilation system and pushing the AIR and TEMP buttons operate the electric fan at the fastest speed and set the lowest temperature possible on the display (LO).

After activating the air conditioning system as described above two conditions may occur:

1. the electromagnetic coupling of the compressor pulley is not engaged;
2. the electromagnetic coupling of the compressor pulley engages and disengages cyclically.

In the first case connect the power supply cable of the coupling using a test cable with a fuse to the positive terminal on the battery.

If the coupling does not engage after its earth connection has been checked substitute the solenoid. If the coupling engages, disconnect the test cable and measure the pressure in the accumulator-dehydrator (pressure gauge reading on the low pressure side).

If the pressure exceeds 3.45 bars short-circuit the pressure switch (located on the hose connecting the evaporator to the accumulator) and check to see if the coupling engages. If it does, replace the pressure switch otherwise check the power supply circuit to see if it is interrupted.

If the pressure (low pressure side) is below 3.45 bars, read the pressure value from the pressure gauge on the high pressure side.

If the pressure is below 3.45 bars the system is leaking. Find the leak using a leak finder and after having blocked it, dehydrate and refill the system.

If the pressure exceeds 3.45 bars, discharge the system and check to see if the high pressure circuit (compressor-evaporator) or the expansion valve are partially blocked.

In the second case feel the temperature of the first stretch of hose connecting the the condenser to the

evaporator (the high pressure part of the circuit before the expansion valve).

If the hose is cold it is partially blocked or squashed and it is necessary to discharge the system, replace the hose and dehydrate and refill the system.

If the hose is uniformly warm measure the temperature of the inlet and outlet ducts on the evaporator.

If these are at the same temperature or the outlet duct is colder than the inlet, check that the pressure (low pressure side) engages and disengages the electromagnetic coupling of the compressor pulley.

The calibration pressures of the pressure switch which serves as a switch for the power supply circuit of the electromagnetic coupling are:

circuit closes: 2.826 + 3.516 bars (compressor working);

circuit opens: 1.38 + 1.93 bars (compressor off).

Three different conditions may arise:

1. the compressor functions continuously and the pressure (low pressure side) is maintained within the limits given above;
2. the compressor functions cyclically within the limits of the pressure limits given above;
3. the compressor cuts in at a pressure above 3.516 bars or cuts out at a pressure below 1.38 bars.



In the third case replace the one-level pressure switch installed on the hose connecting the evaporator to the accumulator-dehydrator.

In the first case disconnect the power supply cables from the electric fan of the evaporator and check the pressure at which the compressor cuts off.

If the expansion valve cuts in at a pressure below 1.38 bars, replace the pressure switch. If it cuts out at 1.38 + 1.93 bars, or if the pressure does not decrease insert a thermometer in the central and side outlets.

The same procedure must be followed if the second case arises.

| Environmental temperature | 21°C | 27°C | 32°C | 38°C | 43°C |
|--------------------------------|----------|------|----------|------|-----------|
| Air temperature at the outlets | 4° + 7°C | | 6° + 8°C | | 7° + 10°C |

If the air temperature leaving the outlets in relation to the environmental temperature is within the limits given in the table the system is working correctly. On the other hand if the temperature of the air leaving the outlets is higher then or equal to the highest value in the table, check the cycles of the compressor.

Two conditions may arise:

1. the compressor is continuously engaged;
2. the compressor cuts on and off cyclically or stays off for long periods.

1. In the first case discharge the system and check to see if the expansion valve is missing. If it is, insert a new valve in the second stretch of the hose connecting the condenser to the evaporator and dehydrate and refill the system.

If the expansion valve is correctly installed in the hose and in perfectly clean the system is overloaded. Dehydrate and refill the system.

If, after the system has been refilled, it still presents problems, replace the accumulator-dehydrator as the dehydrator element will be saturated.

2. In the second case discharge the system and check to see if the expansion valve is blocked. If it is, replace it and then dehydrate and refill the system.

If, on completion of the operation described at point 1 the inlet duct on the evaporator is colder than the outlet duct, check that there are no leaks.

If the system is leaking, find the leaks and after remedying the problem dehydrate and refill the system.

If there are no leaks add 500 grams of refrigerant and check the engagement and disengagement cycles of the the compressor.

If the cycles exceed eight per minute, discharge the system and check to see if the expansion valve is blocked. Restore the system, dehydrate and refill.

If there are eight cycles or less measure the temperature of the evaporator inlet and outlet ducts.

If the temperature of the inlet duct is the same as or higher than that of the outlet duct, add 500 grams of refrigerant. If the temperature of the inlet duct is lower than that of the outlet duct, add 500 grams of refrigerant and again measure the temperature in the two ducts.

If the temperature of the inlet duct is lower than that of the outlet duct, discharge the the system and check to see if the expansion valve is blocked. Restore the system, dehydrate and refill.



OPERATIONAL CONTROL AND EXPEDIENTS FOR THE SUBSTITUTION OF SYSTEM COMPONENTS

Condenser

During the normal operation the temperature varies between 48 and 94 °C and the pressure ranges from 13.35 to 26.50 bars.

If, during operation of the system, the temperature rises downstream of the condenser and the compressor cuts-off due to the three-level pressure switch, there is a condensing deficiency in the system. The following operations should therefore be carried out in order:

1. Check that the three-level pressure switches are working correctly, and replace them if they are not.
2. If the pressure switch is working correctly check that the condenser is not blocked on the outside. If it is remove all impurities and straighten the blades so that cooling air can circulate freely through the condenser.
3. If the condenser is not blocked on the outside, check for leaks and to see if it is not partially blocked on the inside. If leaks are found, replace the faulty part. If it is partially blocked unblock it by blowing through with nitrogen.

3-level pressure switch

To check the efficiency of the pressure switch, connect the control apparatus and dehydrate and refill the system (see relative paragraph).

Measure the pressure on the pressure gauge on the high pressure side of the apparatus.

If the pressure exceeds 2.15 bars, start the engine and the air conditioning system and measure the pressures at the beginning and end of the operation of the electric fan of the condenser and radiator.

Disconnect the electrical connection from the power supply cables of the radiator fan and measure the pressure at which the electromagnetic coupling of the compressor pulley is activated and deactivated.

If the pressure exceeds 26.5 bars and the electromagnetic coupling has not cut off stop the engine immediately.

The three-level pressure switch must be replaced if, when the engine is off, the electromagnetic joint is activated at a pressure of 1.65 bars or if the electric fan of the condenser and radiator cuts in at a pressure not included between 14.5 and 16.5 bars, cuts out at a pressure not included between 11.5 and 13.5 bars or if the electromagnetic coupling is deactivated at a pressure exceeding 23.5 to 26.5 bars.



Caution

During the last operation described above pay close attention to the three-level pressure switch as, if it is inefficient and the engine does not cut-off immediately, the rising pressure in the circuit (above 26.5 bars) may cause the pipes to burst.

Accumulator-dehydrator

The accumulator must only be substituted when the expansion valve is blocked or when the evaporator is faulty due to internal corrosion or when the accumulator is leaking.

It is not necessary to substitute the accumulator even if damaged (collision of the vehicle) unless it is leaking.

After disconnecting the accumulator, the hoses connected to it must be plugged immediately.

After disconnecting the accumulator measure the quantity of antifreeze oil contained within it.

The same quantity of clean oil, plus 60 cm³ must be put into the new accumulator before it is installed on the vehicle.

Lubricate the two O-rings located on the connections with clean antifreeze oil.



Compressor

The spare compressors are supplied with an established amount of antifreeze oil (see paragraph "CHARACTERISTIC DATA").

When a compressor is removed from a vehicle the oil within it must be replaced as follows:

- unscrew the drainage cap;
- Drain the oil contained in the compressor into a clean container of a known weight;
- weigh the oil removed from the compressor;

- refill the compressor with the same quantity of clean oil;
- screw the cap back on and tighten to a torque of 14 to 19 Nm.

If the compressor is to be substituted the new part must be completely drained of oil and filled with the quantity of oil as was present in the old compressor.

**TECHNICAL CHARACTERISTICS AND SPECIFICATIONS****TECHNICAL CHARACTERISTICS****ROTARY COMPRESSOR**

| | |
|--|---------------------------------------|
| Make and type | SANDEN SD - 709 NBX 307 |
| Diameter of cylinder | 29.3 mm |
| Stroke | 32.8 mm |
| Theoretical capacity | 154.9 cm ³ each revolution |
| Number of cylinders | 7 |
| Operating voltage of electromagnetic coupling | 12V |
| Minimum cut-in voltage of electromagnetic coupling | 7.5V |
| Power absorption on electromagnetic joint | 48W |

CHECKS AND ADJUSTMENTS**CALIBRATION OF THE THERMOMETER SWITCHES CONTROLLING THE RADIATOR AND CONDENSER**

| | |
|--------------------------|------------------------------|
| Make and type | 2-level VEBE |
| 1st level contact closes | 92 °C ± 2 °C (90 °C + 94 °C) |
| 1st level contact opens | 87 °C ± 2 °C (85 °C + 89 °C) |
| 2nd level contact closes | 97 °C ± 2 °C (95 °C + 99 °C) |
| 2nd level contact opens | 92 °C ± 2 °C (90 °C + 94 °C) |

GENERAL SPECIFICATIONS**FLUIDS AND LUBRIFICANTS**

| APPLICATION | TYPE | NAME |
|---|-------|----------------------------------|
| With reference to air conditioning system | Freon | RIVOIRA Freon 12 <i>0,95 kg</i> |
| Lubrication of air conditioning system compressor | Oil | SUNISO 5GS (135 m ³) |



CALIBRATION OF THE PRESSURE SWITCHES

| Part | Level | Setting (In bars) | Circuit | Function |
|-----------------------------|-------|--|---------|---|
| Three-level pressure switch | 1st | 2.65 ± 0.35 (2.3 + 3) | Closed | Compressor pulley coupling activated |
| | | 2.5 ± 0.25 (2.25 + 2.75) | Open | Compressor pulley coupling deactivated |
| | 2nd | 15.5 ± 1 (14.5 + 16.5) | Closed | Radiator-condenser electric fan operating |
| | | 11.5 ± 1 (10.5 + 12.5) differential 4 ± 1 | Open | Radiator-condenser electric fan deactivated |
| | 3rd | 25 ± 1.5 (23.5 + 26.5) | Open | Compressor pulley coupling deactivated |
| | | 21 ± 1.5 (19.5 + 22.5) differential 4 ± 1 | Closed | Compressor pulley coupling activated |
| One-level pressure switch | 1st | $2.826 + 3.516$ | Closed | Compressor pulley coupling activated |
| | | $1.38 + 1.93$ | Open | Compressor pulley coupling deactivated |

**TIGHTENING TORQUES****AIR CONDITIONING SYSTEM**

| DESCRIPTION | N·m | kg·m |
|---|---------|-----------|
| Female connection securing evaporator/accumulator hose to evaporator (T.I.T.) | 44 + 53 | 4.5 + 5.4 |
| Male connection securing evaporator/accumulator hose to evaporator (T.I.T.) | 44 + 53 | 4.5 + 5.4 |
| Female connection securing accumulator/compressor hose on accumulator (only for 2.4 V6) | 44 + 53 | 4.5 + 5.4 |
| Nut on end of accumulator/compressor hose on compressor (only for 2.4 V6) | 50 + 61 | 5.1 + 6.2 |
| Female connection securing accumulator/connection on accumulator (only for 1.8 - 2.0 TS) | 44 + 53 | 4.5 + 5.4 |
| Female connection securing compressor hose/connection side to connection (only for 1.8 - 2.0 TS) | 44 + 53 | 4.5 + 5.4 |
| Nut on end of compressor/connection side hose on compressor (only for 1.8 - 2.0 TS) | 50 + 61 | 5.1 + 6.2 |
| Female connection securing compressor/condenser hose on condenser | 19 + 23 | 1.9 + 2.3 |
| Female connection securing condenser/evaporator hose to condenser and evaporator (only for 2.4 V6) | 19 + 23 | 1.9 + 2.3 |
| Female connection securing evaporator/orifice connection hose on evaporator (only for 1.8 - 2.0 TS) | 19 + 23 | 1.9 + 2.3 |

ELECTRICAL SYSTEM

| DESCRIPTION | N·m | kg·m |
|--|-----------|------------|
| Screw securing conditioner control unit to crossmember of body | 2.5 + 5.9 | 0.25 + 0.6 |

**SPECIFIC TOOLS**

| TOOL NUMBER | DESCRIPTION |
|---------------|--|
| 1.822.111.000 | Socket spanner for Freon hose connection |
| 1.822.112.000 | Box claw spanner for Freon hose connection |
| 1.822.113.000 | Square spanner for Freon hose connection |
| 1.822.115.000 | Toothed spanner for Freon hose connection |
| 1.823.015.000 | Puller for plastic buttons |